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ABSTRACT

This competency-based program guide provides course content information and procedures for secondary schools, postsecondary vocational schools, and community colleges in Florida that conduct programs in diesel engine mechanics and heavy duty truck and bus mechanics. The first section is on legal authority, which applies to all vocational education programs in Florida. The second section describes the content of the diesel engine and truck and bus mechanics program, including occupational descriptions, program standards descriptions, competencies, curriculum frameworks and student performance standards for each occupation. The third section, on Diesel Mechanics, covers instructional approach, course outline and sample lesson plan, and information on student organizations. In the fourth section, student admission requirements and teacher certification and qualifications are spelled out, while the fifth section provides information on facilities and supplies for the diesel engine and truck and bus mechanics curriculum. The final section lists instructor resources (both printed and audiovisual materials), and professional organizations and support services. Appendixes to the guide consist of a diagram of facilities needed for the program and an organization chart for the student organization, Vocational Industrial Clubs of America. (KC)

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PROGRAM GUIDE
FOR

DIESEL ENGINE MECHANICS
8742000 (IN47.060500)

AND

HEAVY DUTY TRUCK AND BUS MECHANICS
DIM0991 (IN47.060501)

Prepared by

Department of Adult & Vocational Education
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INTRODUCTION

This Program Guide has been developed to provide information that will be useful to local school district and community college administrators, instructors, program advisory committee members, regional coordinating councils, and others charged with the responsibilty of offering vocational education programs. The final planning and evaluation of any educational program, however, must be done within the context of local conditions. This publication will serve to identify the major concerns that should be considered in the organization, operation, and evaluation of a vocational education program.

The Legal Authority sections of the Guide relate to vocational education programs in general. The remaining sections relate specifically to the vocational education program course for which the Guide is designed.

Vocational education has evolved to meet the needs of students desiring to pursue a selected vocation. In general, vocational education is designed to provide programs, services, and activities that are realistic in light of present and future employment opportunities. In recent years, applications of science and technology have expanded rapidly, increasing the education and training required of workers. The new technologies require many additional technical supportive staff to carry out both standardized and specialized procedures.

Today, vocational education is an increasingly viable option for students. The Florida Department of Education shares with business and industry the determination to provide opportunities for upward mobility to as many Floridians as possible. In order to do this, it is necessary both to create exemplary vocational programs and to make those programs consistent throughout the state.

State Board of Education Administrative Rule 6A-10.24: Articulation between universities, community colleges, and school districts outlines steps and guidelines that will bring about a systematic interrelationship between Florida institutions offering similar or related courses and programs. The rule states, in part, that:

> When a student tranfers among postsecondary vocational-technical centers, community colleges, and universities, the receiving institution shall award credit for courses satisfactorily completed at the previous institutions when the courses are judged ... to be equivalent to courses offered at the receiving institution.

This Program Guide helps ensure that equivalency. Throughout Florida, vocational programs, if implemented according to the criteria described in this document, will help many citizens fill an important place in our state and national work force.

LEGAL AUTHORITY

Program Standards

Vocational education programs are established pursuant to Florida Statutes (hereafter F.S.) and enabling Administrative Rules adopted by the Florida State Board of Education (hereafter S.B.E.).

Section 233.0682 F.S.: State Board regulations states:

> The State Board of Education shall adopt regulations setting forth minimum requirements for a comprehensive vocational education program, and shall adopt procedures for determining the extent to which such minimum requirements are being met. Such requirements shall include examination of the employment performance of program participants as well as standards of educational output, with particular emphasis on job placement and satisfactory performance in employment.

This statute is administered by S.B.E. Administrative Rule 6A-6.21: Comprehensive Vocational Education Program; definition, which states, in part, that:

> the term comprehensive vocational education shall include occupational education programs not leading to a bachelor's degree. A comprehensive vocational education program is one which provides vocational programs, services and activities of high quality, realistic in light of actual or anticipated opportunities for gainful employment and suited to the needs, interests, and abilities of the persons to be served.

For the purpose of defining the vocational education programs administered by community colleges within the state, the Division of Community Colleges has adopted S.B.E. 6A-14.34 to implement 240.355 F.S.: State Board of Education Rules, which authorizes "each community college district board of trustees to initiate and provide comprehensive vocational education programs." (NOTE: S.B.E. Rule 6A-14.34 is identical to S.B.E. Rule

6A-6.621 [see above], except that all S.B.E. Chapter 6A-14 rules refer to Division of Community College-sponsored programs, while S.B.E. Chapter 6A-6 rules refer to programs sponsored by the Division of Vocational, Adult, and Community Education.)

S.B.E. Rule 6A-6.571: Criteria for qualification of special vocational-technical education program courses provides for the annual publication of Vocational Education Program Courses Standards. These course standards for each vocational education program are approved by the Florida State Board of Education and published by the Division of Vocational, Adult, and Community Education.

The Program Course Standards provide program descriptions and statements of program objectives that must be adhered to by the school districts in offering vocational programs. The extent to which these Standards are adhered to forms the basis for program review and evaluation.

Special funding provisions for vocational programs are determined in relation to all other education programs under Section 236.081 F.S.: Funds for the operation of schools.

Program Planning

The Vocational Education Planning Process, published in 1980 by the Division of Vocational Education, outlines the procedures local education agencies should follow in developing and submitting their five-year and annual plans for the operation of vocational education programs.

The legal basis for program planning is found in Section 229.55 F.S.: Educational Accountability Act of 1976, and 299.555 F.S.: Educational planning and information systems. These statutes address various aspects of the process of planning effective instructional programs at each level—

from the local school district to the state level. These Florida Statutes are implemented by S.B.E. 6A-6.67: Coordinating Council for vocational education, adult general education, and community instructional services, S.B.E 6A-6.70: Direct job-related vocational offerings required for each school district, and S.B.E. 6A-6.71: Student services.

School districts are encouraged to utilize the resources and support of business, industry, and the community in planning vocational programs. A portion of S.B.E. Rule 6A-6.67, which has particular implications for planning for specific vocational programs in specific schools, follows:

> The responsibilities of the [coordinating] council shall be to review the total vocational education, adult general education, and community instructional services program being offered in the district, to make such recommendations as are necessary, to encourage the development of needed offerings or changes in existing offerings and to avoid unwarranted duplications.

(S.B.E. Rule 6A-14.37 addresses this topic in identical language for community college programs.)

Program Structure

The legal basis for Florida's comprehensive vocational education structure may be found in S.B.E. Rules 6A-6.621 and 6A-14.34: Comprehensive vocational education, definition; 6A-6.63 and 6A-14.343: Scope of vocational education; 6A-6.64 and 6A-14.344: Types of vocational education courses and activities; and 6A-6.65 and 6A-14.345: Instructional components of vocational education.

Perhaps the legal basis for Florida's comprehensive vocational program is stated best in S.B.E. Rules 6A-6.65 and 6A-14.345. These rules define the components of vocational education instruction, beginning with introduction to the world of work in grades 1-6; exploratory experiences in grades 7-9; job-related experiences and prevocational training instruction

in grades 10-12; and adult-level training and retraining programs. Special needs of disadvantaged and handicapped individuals at all levels—grade 1 through adults—are considered and provided for. Based upon these rules, Florida has developed a statewide comprehensive vocational program that is recognized as one of the best in the nation.

Program Development

Vocational program development is geared to meet the needs of Florida's employers and students. The vocational planning process incorporates information from business and industry, including data on employers' needs and on emerging trends and changes in technological processes. Legal basis is provided by S.B.E. Rules 6A-6.64 and 6A-14.344, both entitled Types of vocational education courses and activities, for the development of the many vocational courses and programs that must be offered to meet the needs of employers and students. These rules will be amended in the future to bring them more into conformity with 1983 legislation.

Section 228.041 F.S. defines vocational education as follows:

> (22) "Vocational education" is defined as meaning that instruction not leading to a baccalaureate degree, either graded or ungraded, listed below:
>
> (a) Job-preparatory instruction in the minimum competencies necessary for effective entry into an occupation, including diversified cooperative education, work experience, and job entry programs which coordinate directed study and on-the-job training;
>
> (b) Exploratory courses designed to give students initial exposure to the skills and aptitudes associated with a broad range of occupations in order to assist them in making informed decisions regarding their future academic and occupational goals;

(c) Supplemental programs designed to enable persons who are or have been employed in a specific occupation to upgrade their competencies in order to re-enter or maintain stability or advance within their occupation; or

(d) Practical arts courses designed to teach students practical generic skills which, though applicable to some occupations, are not designed to prepare students for entry into specific occupations. Such courses may include, but may not be limited to, typing, industrial arts, and home economics.

Program development is based largely on identifying and meeting the requirements of employers and credentialling agencies. Significant input is sought from advisory groups, ad hoc committees, and task forces made up of representatives from business and industry and instructional, supervisory, and administrative personnel. The Division of Vocational, Adult, and Community Education, the school districts, and community colleges work together to develop programs with objectives that are consistent with employers' requirements.

Educational standards are established for program development. Using these standards as guides and guidelines, effective programs are developed that meet the goals of vocational education, particularly the major goal of preparing students for entry-level employment. These standards are grouped into three categories: input, process, and product. First, standards of input govern requirements for teachers, facilities, and materials. Second, standards of process help determine requirements for instruction, curriculum selection, placement, and evaluation. And third, standards of product are determined by the number and degree of competencies students achieve and by the placement of trained students in jobs.

Program Review and Evaluation

The primary purpose of program review is program improvement. To accomplish this purpose, a review of each vocational program is necessary to determine those areas in which program improvement can be implemented most effectively.

The legal basis for program review is found in Chapter 229.565 F.S. Educational evaluation procedures. Section (3)(e) of that statute requires the Commissioner of Education to periodically examine and evaluate "the standards by which the school district evaluates basic and special programs for quality, efficiency, and effectiveness."

The term "special programs," as used here, includes vocational programs. In turn, under S.B.E. Rule 6A-1.453: Educational program audits, the Commissioner directs the Division to examine and evaluate vocational programs.

S.B.E. Rule 6A-1.453 provides for periodic audits of both the accounts and programs of each school district. It states in part that the Division shall be responsible for examination of vocational education programs to:

a. Determine compliance with law and criteria established by rules of the State Board;

b. Ensure that individual courses use instructional objectives which are consistent with the criteria for qualification of individual courses as outlined in the publications titled, "Vocational Education Program Courses Standards," Rule 6A-6.571, FAC; and

c. Determine that the capability exists in the instructional setting to accomplish the course objectives.

Under this same rule, the Division also is responsible for: "Examination of adult and community education programs to determine compliance with law and criteria established by rules of the State Board" and "determination of the existence and comprehensiveness of the criteria

based on district goals, by which the school district evaluates vocational education and adult general education programs."

The Vocational Education Program Courses Standards (and the new Curriculum Frameworks) provide program descriptions and objectives that may be used as criteria against which the program may be reviewed and evaluated. Basically, program review consists of a self-study by the staff of the program to be reviewed, a visitation and review by a Division staff member, a final report outlining areas of strengths and weaknesses, and a plan for strengthening weaknesses and/or improving the program. The data from the program review instruments are treated statistically and incorporated into the evaluation system.

Program Advisory Committees

Program advisory committees are mandated by federal (Public Law 90-576) as well as state regulations. A single State Advisory Council is provided for in S.B.E. Rule 6A-6.75: Advisory Council for Vocational Education. Committees for individual programs are covered under S.B.E. Rule 6A-6.74: Duties and responsibilities, which states that the director of the Division of Vocational, Adult, and Community Education shall "direct the work of the Division to insure the greatest possible coordination, efficiency and effectiveness in vocational and technical education in the state." The Division encourages program advisory committees as a means of fulfilling this mandate.

The Division utilizes a number of advisory committees in addition to those required by law. Each program area--Agribusiness and Natural Resources, Business, Diversified Occupations, Health Occupations, Home Economics, Industrial, Marketing and Distributive, and Public Service

Education--has a corresponding state advisory committee. Also, many general advisory committees have been formed to deal with special programs and problems.

Several advisory committees assist school districts and community colleges with vocational program planning and operation. The legal basis for such use of advisory committees may be found in S.B.E. Rules 6A-6.68 and 6A-14.38, both entitled Business and industrial community support. These rules state that school boards and boards of trustees at all levels should take positive steps (which are enumerated) to establish two-way communications and mutual responsiveness between their institution's vocational education program system and the surrounding business and industrial community.

These rules are responsive to the fact that in program development, implementation, and evaluation it is especially important that advisory committees be effectively utilized at the state and local levels. Community resources are an important part of vocational program development.

DESCRIPTION OF THE OCCUPATION

This Competency Based Program Guide provides course content information and procedures for secondary, postsecondary vocational schools, and community colleges, conducting programs in the occupational area of Diesel Engine Mechanics and Heavy Duty Truck and Bus Mechanics.

The Federal Dictionary of Occupational (D.O.T.) Job Titles identifies this occupational area as follows:

D.O.T. JOB TITLE	D.O.T. CODE
Diesel Mechanic	(625.281-010)
Diesel Mechanic, Helper	(625.684-010)
Preventive Maintenance Mechanic	(620.281-050)
Electrical System Specialist	(825.281-022)
Fuel Injection Specialist	(625.281-022)
Truck and Bus Mechanic	(625.281-010)

The definition (description) for each of these job titles is abstracted from the D.O.T. for easy reference.

Diesel Mechanic (625.281-010)
Repairs and maintains diesel engines used to power machines, such as buses, ships, trucks, railroad trains, electric generators, and construction machinery, using handtools, precision-measuring instruments, and machne tools: Diagnoses trouble, disassembles engines, and examines parts for

defects and excessive wear. Reconditions and replaces parts, such as pistons, bearings, gears, valves, and bushings, using engine lathes, boring machines, handtools, and precision-measuring instruments. May weld and cut parts, using arc-welding and flame cutting equipment.

Diesel Mechanic Helper (625.684-010)
Assists Diesel Mechanic in overhauling and maintaining diesel motors used to operate trucks, generators, and other equipment: Disassembles motor and cleans parts. Obtains parts from stock and hand tools to mechanic. Assists in reassembly, and cleans tools and working area.

Preventive Maintenance Mechanic (620.281-050)
Repairs and maintains electric, diesel, and gasoline industrial trucks following manuals, and using handtools, power tools, and knowledge of electrical, power transmission, brake, and other automotive systems: Reads job order and observes and listens to truck in operation to determine malfunction and to plan work procedures. Installs new ignition systems, aligns front wheels, changes or recharges batteries, and replaces transmissions and other parts, using handtools. Overhauls gas or diesel engines, using mechanic's handtools, welding equipment, standard charts, and hoists. Examines protective guards, loose bolts, and specified safety devices on trucks, and makes adjustments, using handtools. Lubricates moving parts and drives repaired truck to verify conformance to specifications. May fabricate special lifting or towing attachments, hydraulic systems, shields, or other devices according to blueprints or schematic drawings.

Electrical System Specialist (825.281-022)

Repairs and overhauls electrical systems in automotive vehicles, such as automobiles, buses, and trucks: Confers with customers to determine nature of electrical malfunction. Determines malfunction of elctrical system by visual inspection and by use of testing devices, such as oscilloscope, voltmeter, and ammeter. Adjusts ignition timing and measures and adjusts distributor breaker-point gaps, using dwell meter or thickness gage. Tests and repairs starters, generators, and distributors. Repairs or replaces defective wiring in ignition, lighting, air-conditioning, and safety control systems, using electrician's handtools. Rebuilds electrical units, such as starters, generators, and door controls. May estimate cost of repairs based on parts and labor charges.

Fuel-Injection Servicer (625.281-026)

Rebuilds, tests, and calibrates fuel injection units as used on diesel engines, railroad locomotives, trucks, construction equipment, tractors, and power plants: Studies repair order and disassembles unit to determine cause of malfunction. Refinishes defective parts, using lapping machine to grind and smooth nozzle point and seat. Replaces parts which cannot be refinished. Assembles and calibrates injection pumps, using test equipment. Assembles and tests nozzle assemblies, using test equipment.

PROGRAM STANDARDS DESCRIPTION

INTRODUCTION

The Division of Vocational, Adult, and Community Education, Florida State Board of Education, is required by S.B.E. Rule 6A-6.571, to publish VOCATIONAL EDUCATION PROGRAM COURSE STANDARDS annually. The first such standards were published in 1985 and consisted of brief 1-2 page documents called CURRICULUM FRAMEWORKS. These Frameworks contained very brief statements of program objectives and course standards.

Curriculum Frameworks are included in this section of the Program Guide, and contain revised information based on the industry validated competency list. Along with the Curriculum Frameworks are detailed lists of performance objectives called STUDENT PERFORMANCE STANDARDS. The Student Performance Standards are basically performance objective statements for each item on the competency list.

—CAREER MAP COMPETENCY LIST

The Career MAP Competency List was developed by an Industry Advisory Committee and serves as the basis for the Career MAP. This Competency List has been validated by the Industry Representatives and reviewed by Educational Representatives noted in the acknowledgements section of this guide. The list relects the entire range of job tasks performed by employees in industry related jobs. It may include more tasks than is normally taught in a vocational program at any one particular school level and will require that instructors and administrators determine which

specialty areas and tasks are appropriate for their program.

—CURRICULUM FRAMEWORKS

The Curriculum Framework specifies the course title and course number, applicable level, major course concepts, and intended outcomes. The intended outcomes section has been correlated with the competency list to include only those performance areas applicable to the course level and purpose.

—STUDENT PERFORMANCE STANDARDS

The Student Performance Standards are abstracted from the Career MAP Competency List, and corresponds to the Curriculum Framework. Student Performance Standards list the detailed performance objectives that support the intended outcomes identified in the Curriculum Frameworks.

—PROGRAM ARTICULATION

Vocational programs that teach the same subject at high schools, vocational technical schools, and community colleges should be structured to eliminate unnecessary retraining of students who have mastered competencies at a lower school level. This coordination of programs at different school levels is referred to as ARTICULATION. Specifically -ARTICULATION- is an arrangement between secondary and vocational-technical centers, and community colleges, which would allow a student who completed a secondary vocational program to enter an area vocational-technical center or community college and receive credit for the secondary vocational program and be placed in the higher level program at an advanced level. It would also allow a student who completed a vocational program in an area vocational-technical center to

enter a community college program and receive credit for the area vocational-technical center program and be placed in the higher level program at an advanced level.

ARTICULATION in this manner will require vocational teachers to interview each student entering a postsecondary level program and determine what competencies have been previously mastered. The teacher may have to utilize the Career MAP, if available, or some type of pre-test or performance evaluation to verify that the student is in fact still competent in the appropriate tasks. Teachers of postsecondary programs will often have two or more course tracks operating simultaneously, one for those students with no prior experience, and one or more individualized or small group tracks for students with various levels of prior experience.

—CAREER MAP UTILIZATION

I. Career MAP Definition:

A Career Merit Achievement Plan (Career MAP) is a matrix of vocational competencies that is designed for individual students to record the skills they have mastered in school or industry. The MAPs primarily list performance competencies, although some cognitive competencies are included. Career MAPs contain blocks in which each individual task is listed and includes a line for the instructor to sign, indicating that the student has become competent in the performance of the task. Career Maps are published and distributed separately from the Program Guide.

II. Purpose of Career MAPs:

Career MAPs are being developed for each Industrial Education program in the State of Florida as a means to document student activity and performance and to communicate that activity to employers. The MAPs, showing what a student has already mastered, could also be used by the student when transfering to another school system or a higher level program, to integrate the student into those training programs at the student's level of competence. This is particularly important when entering competency based programs using "open entry-open exit" methodology, or when entering an on-the-job industrial training course. Many companies require employees to periodically attend skill upgrade and crosstraining courses and attend short courses for new equipment and process familiarization. The Career MAP can also be used by employees to record their achievement in industry sponsored training activity, so the MAP becomes an individuals lifetime record of technical competency.

III. Recommended Utilization of Career MAPs:

A. Teachers in Florida Industrial Education and other Vocational related programs should provide every student they teach, a Career MAP to record the student's mastery of each competency completed in the course. Teachers should ensure that the use of Career MAPs are explained to students and should ensure that the students take their Career MAPs with them when they leave the course.

B. Students should use Career MAPs as a record of their technical competence as they progress from high school courses and/or

through vocational technical schools, or through community colleges and on into industrial training programs provided by employers. Students pursuing vocational technical careers should use the Career MAP as an overall record of their entire career achievement, maintaining other individual certificates of course completion as supporting documents for Career MAPs.

IV. Career Map Development:

Draft lists of competencies were developed by Industrial Advisory committees under a project administered by the Univerisity of South Florida and funded by the Vocational Division of the State Department of Education. These lists were then reviewed, revised, and validated by craft advisory committees throughout Florida. Committees of teachers as well as industry experts then reviewed the lists. Finally, after Competency Lists were approved by both industry and educational advisors the lists were typeset in a matrix format and printed by the Department of Education. The developers of the MAPs had access to any V-TECS catalogs or Student Performance Standards that were applicable. If objectives were judged relevant they were included but sometimes in different wording. Some competencies listed on the MAP may actually encompass several objectives from other sources or might even be considered as subskills to V-TECS. Career MAPs list competencies that could be learned either in school or after a person has been on the job. Career MAPs, as the words suggest, map the competencies achieved by a person through school training and job experiences.

V. Career MAP's use with Program Guides and Standards:

Course/Program Standards have traditionally been used in the Program Review process and will continue to be used. The Career MAPs do not replace Course/Program Standards. MAPs usually contain competencies beyond those required at the job-entry level. Future editing of Course/Program Standards will more than likely reflect the wording of many of the competencies in the Career MAPs.

Program Guides will be developed for all vocational programs having validated MAPs. The Guide brings together into one document the critical components necessary to initiate or update an existing program. Included in the Program Guide are the MAP competencies, the Program Standards, and guidelines for curriculum development, use of local craft advisory committees, facilities planning, etc.

Career MAPs are intended to facilitate articulation and communication regarding specific vocational programs. The Career MAP is a baseline document for planning and can be used for a variety of purposes: student counseling; curriculum planning; teacher recruitment, and selection; teacher and program updating; facility layout and design; equipment requirement planning; student evaluation; program improvement; and for discussions with craft advisory committees.

Career MAPs can be used to profile the competencies to be mastered for one or more Dictionary of Occupational Titles (DOT) occupations within the major occupational area. Career MAPs reflect state-of-the-art technology for the occupational area and accommodate

competency mastery in an industrial setting through cooperative or internship arrangements. Some advanced competencies included on the MAPs are desirable but not necessary for initial employment and may be learned later as supplemental training. Teachers can acquire class sets of the MAPs and use them daily with students from the first day of instruction, or, after keeping separate records of students' mastery of competencies, teachers can transfer these to the MAP just before students exit from the program. Students can request future employers to authenticate additional competencies as they master them on the job.

VI. Obtaining Additional MAPs:

Contact the Industrial Education Regional Consultant or the DVE Regional Office to order MAPs. Entire class sets are available for teacher use. Teachers or users outside the targeted population may purchase sets for a nominal cost-recovery fee. For additional information or training in the use of the Career MAPs contact the Regional Consultant or:

Dissemination and Diffusion Section
Division of Vocational Adult
& Community Education
Department of Education
Knott Building
Tallahassee, FL 32301
(904) 488-0405 or Suncom 278-0405

VALIDATED LIST OF COMPETENCIES

DIESEL ENGINE MECHANICS

November 25, 1985

Listed below are the competencies that each Diesel Engine Mechanic should possess to be a productive beginning worker in this occupation. The number to the right of each competency represents the specialization areas indicated below. If a number appears to the right of a competency, that competency is considered essential to the specialization area.

Number	Specialization
1	Diesel Mechanic (625.281-010)
2	Diesel Mechanic, Helper (625.684-010)

01.0 DIESEL TRADE SKILLS

001	Follow safety practices (P)	1 2
002	Apply basic math skills (P)	1 2
003	Apply intermediate math skills (P)	1 2
004	Recognize, identify, & make metric conversions (P)	1 2

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005	Perform basic welding skills (P)	1 2
006	Use hand tools (P)	1 2
007	Use power tools (P)	1 2
008	Use measuring & precision tools (P)	1 2
009	Identify types of bearings & seals (C)	1 2
010	Identify power train components & functions (C)	1 2
011	Identify threaded fasteners by size, type, thread series, thread classes, material hardness, & compatibility (C)	1 2
012	Read & use parts manuals (P)	1 2
013	Read, interpret, & apply service manuals (P)	1 2

02.0 ELECTRICAL PRINCIPLES

001	Identify the nature of electricity (C)	1 2
002	Analyze electrical circuits (P)	1 2
003	Define Ohm's & Kirchhoff's law (C)	1 2
004	Identify magnetism & electromagnetic induction (C)	1 2
005	Identify application of alternating current (C)	1 2
006	Identify principles of DC motors & generators (C)	1 2
007	Identify principles of AC motors (C)	1 2
008	Locate & match electrical units by their symbols on a wiring diagram (P)	1 2
009	Set up & use voltmeters, ammeters, & ohmmeters (P)	1 2

03.0 ELECTRONIC PRINCIPLES

001	Identify principles of diodes & rectifiers (C)	1	2
002	Identify principles of voltage regulation & power supply circuits (C)	1	2
003	Identify principles of transistors (C)	1	2
004	Identify principles of the silicon controlled rectifier (SCR) (C)	1	2
005	Identify components of electronic systems & their functions (C)	1	2

04.0 DIESEL ENGINE MAINTENANCE & REPAIRS

001	Identify diesel engine operating principles (2- & 4-stroke cycle engines) (C)	1	2
002	Identify components of 2- & 4-stroke cycle engines (C)	1	2
003	Troubleshoot & repair cooling systems (P)	1	
004	Troubleshoot & repair lubrication systems (P)	1	
005	Troubleshoot & repair induction & exhaust systems (P)	1	

05.0 ELECTRICAL SYSTEMS MAINTENANCE

001	Test & service batteries (P)	1	2

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002	Test & repair starting systems (P)	1	2
003	Test & repair DC charging systems (P)	1	2
004	Test & repair AC charging systems (P)	1	2
005	Test & repair ignition systems (P)	1	2
006	Test & repair lighting & accessories systems (P)	1	2
007	Test & service instruments & gauges (P)	1	2

06.0 DIESEL FUEL INJECTION SYSTEMS RECONDITIONING

001	Identify fuel injection systems principles & components (C)	1	2
002	Troubleshoot fuel injection systems & components (P)	1	
003	Remove, replace, & adjust fuel injection systems & components (P)	1	2
004	Identify governor types & operating principles (C)	1	2
005	Troubleshoot governors (P)	1	
006	Remove, repair or replace, & adjust governors (P)	1	2

07.0 DIESEL ENGINE COMPONENTS RECONDITIONING

001	Explain the basic principles of the operation of the 4-stroke cycle diesel engine (C)	1	2
002	Identify engine assemblies & systems (C)	1	2

003	Diagnose valve & head problems by use of the visual inspection method (P)	1	
004	Diagnose valve & head problems by use of the compression tester method or cylinder air pressure method (P)	1	
005	Diagnose valve & head problems by use of the stethoscope method (P)	1	
006	Disassemble engine (P)	1	2
007	Clean & inspect head for cracks, warpage, & injector sleeves (P)	1	2
008	Inspect valves for warpage, burns, cracks, stem wear, tip wear, & valve seat (P)	1	2
009	Grind valve seats & reface valves (P)	1	2
010	Check & inspect springs for free height, distortion, & installed height (P)	1	2
011	Adjust valve lash (P)	1	2
012	Remove & inspect camshaft bearings & lifters (P)	1	2
013	Time valve drive assembly (P)	1	2
014	Remove piston from rod assembly (P)	1	2
015	Measure out-of-round & cylinder taper with dial bore gauge or micrometer (P)	1	2
016	Check piston pin & boss for wear (P)	1	2
017	Measure piston ring lands width, out-of-round, & taper (P)	1	2
018	Measure piston ring gap in cylinder bore (P)	1	2
019	Install & fit piston pin (P)	1	2
020	Check rod & piston assembly alignment (P)	1	2

021	Remove & replace rod bearing (P)	1	2
022	Hone cylinder & clean (P)	1	2
023	Install rings on piston (P)	1	2
024	Measure & check crankshaft with micrometer (P)	1	2
025	Check bearing bore with telescoping gauge (P)	1	2
026	Reassemble engine using plastic gauge (P)	1	2
027	Install oil seals (P)	1	2
028	Check for end play (P)	1	2

08.0 DIESEL ENGINE OVERHAUL (2-STROKE & 4-STROKE CYCLE ENGINES SUCH AS CATERPILLAR, CUMMINS, DETROIT, MACK, ETC.)

001	Troubleshoot & diagnose engine problems (P)	1	
002	Remove & install electrical equipment (P)	1	2
003	Recondition turbocharger, blowers, & superchargers (P)	1	2
004	Recondition cooling system (P)	1	2
005	Recondition intake & exhaust manifolds (P)	1	2
006	Recondition fan, vibrator damper, & front pulleys (P)	1	2
007	Recondition air compressor (P)	1	2
008	Recondition flywheel (P)	1	2
009	Recondition flywheel housing (P)	1	2
010	Recondition lubrication system (P)	1	2
011	Recondition front cover (P)	1	2
012	Remove & install fuel system (P)	1	2
013	Recondition cylinder head (P)	1	2

014	Recondition cylinder sleeve & piston (P)	1 2
015	Recondition camshaft & accessory drive (P)	1 2
016	Recondition crankshaft (P)	1 2
017	Recondition cylinder block (P)	1 2
018	Perform dynamometer test (P)	1 2

09.0 DIESEL ENGINE PREVENTIVE MAINTENANCE (PM)

001	Perform PM inspection "A" (P)	1 2
002	Perform PM inspection "B" (P)	1 2
003	Perform PM inspection "C" (P)	1 2

10.0 EMPLOYABILITY SKILLS

001	List sources of job openings other than public or private employment agencies (P)	1 2
002	Write a letter of application for a job (P)	1 2
003	Prepare a resume or personal fact sheet (P)	1 2
004	List factors to consider when applying for a job (P)	1 2
005	List ways of making contact with employers (P)	1 2
006	Identify documents which may be required when applying for a job interview (C)	1 2
007	Complete a job application form correctly (P)	1 2

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008	Identify appropriate dress & grooming for a job interview (C)	1 2
009	Classify behaviors considered to be appropriate or inappropriate in a job interview situation (C)	1 2
010	Describe the advantages to the employer & employee of being a productive worker (C)	1 2
011	Explain the purpose of supervision, self-discipline & performance evaluation (C)	1 2
012	Identify appropriate response(s) to criticism from employer, supervisor, or other employees (C)	1 2
013	List consequences of frequently being absent from the job (P)	1 2
014	List consequences of frequently arriving late for work (P)	1 2
015	List factors to consider when resigning from a job (P)	1 2
016	Write a letter of resignation (P)	1 2
017	Exhibit a positive work attitude (P)	1 2
018	Practice good personal hygiene (P)	1 2
019	Qualify for the written part of ASE certification (C)	1 2

KEY

(C) Cognitive

(P) Performance

VALIDATED LIST OF COMPETENCIES

HEAVY DUTY TRUCK AND BUS MECHANICS

November 25, 1985

Listed below are competencies that each Heavy Duty Truck and Bus Mechanic should possess to be a productive beginning worker in this occupation. The number to the right of each competency represents the specialization areas indicated below. If a number appears to the right of a competency, that competency is considered essential to the specialization area.

Number	Specialization
1	Diesel Mechanic (625.281-010)
2	Diesel Mechanic, Helper (625.684-010)
3	Preventive Maintenance Mechanic (620.281-050)
4	Electrical System Specialist (825.281-022)
5	Fuel Injection Specialist (625.281-022)
6	Truck and Bus Mechanic (625.281-010)

01.0 DIESEL TRADE SKILLS

001	Follow safety practices (P)	1 2 3 4 5 6
002	Apply basic math skills (P)	1 2 3 4 5 6
003	Apply intermediate math skills (P)	1 2 3 4 5 6
004	Recognize, identify, & make metric conversions (P)	1 2 3 4 5 6
005	Perform basic welding skills (P)	1 2 3 4 5 6
006	Use hand tools (P)	1 2 3 4 5 6
007	Use power tools (P)	1 2 3 4 5 6
008	Use measuring & precision tools (P)	1 2 3 4 5 6
009	Identify types of bearings & seals (C)	1 2 3 4 5 6
010	Identify power train components & functions (C)	1 2 3 4 5 6
011	Identify threaded fasteners by size, type, thread series, thread classes, material hardness, & compatibility (C)	1 2 3 4 5 6
012	Read & use parts manuals (P)	1 2 3 4 5 6
013	Read, interpret, & apply service manuals (P)	1 2 3 4 5 6

02.0 ELECTRICAL PRINCIPLES

001	Identify the nature of electricity (C)	1 3 4 6
002	Analyze electrical circuits (P)	1 3 4 6
003	Define Ohm's & Kirchhoff's law (C)	1 3 4 6
004	Identify magnetism & electromagnetic induction (C)	1 3 4 6
005	Identify application of alternating current (C)	1 3 4 6

006	Identify principles of DC motors & generators (C)	1 3 4 6
007	Identify principles of AC motors (C)	1 3 4 6
008	Locate & match electrical units by their symbols on a wiring diagram (P)	1 3 4 6
009	Set up & use voltmeters, ammeters, & ohmmeters (P)	1 3 4 6

03.0 ELECTRONIC PRINCIPLES

001	Identify principles of diodes & rectifiers (C)	1 3 4 6
002	Identify principles of voltage regulation & power supply circuits (C)	1 3 4 6
003	Identify principles of transistors (C)	1 3 4 6
004	Identify principles of the silicon controlled rectifier (SCR) (C)	1 3 4 6
005	Identify components of electronic systems & their functions (C)	1 3 4 6

04.0 GASOLINE & DIESEL ENGINE MAINTENANCE & REPAIRS

001	Identify gasoline & diesel engine operating principles (2- & 4-stroke cycle engines) (C)	1 2 3 4 5 6
002	Identify components of 2- & 4-stroke cycle engines (C)	1 2 3 4 5 6
003	Troubleshoot & repair cooling systems (P)	1 2 3 4 5 6

004	Troubleshoot & repair lubrication systems (P)	1 2 3 4 5 6
005	Troubleshoot & repair induction & exhaust systems (P)	1 2 3 4 5 6

05.0 ELECTRICAL SYSTEMS MAINTENANCE

001	Test & service batteries (P)	1 3 4 6
002	Test & repair starting systems (P)	1 3 4 6
003	Test & repair DC charging systems (P)	1 3 4 6
004	Test & repair AC charging systems (P)	1 3 4 6
005	Test & repair ignition systems (P)	1 3 4 6
006	Test & repair lighting & accessories systems (P)	1 3 4 6
007	Test & service instruments & gauges (P)	1 3 4 6

06.0 DIESEL FUEL INJECTION SYSTEMS RECONDITIONING

001	Identify fuel injection systems principles & components (C)	1 3 5 6
002	Troubleshoot fuel injection systems & components (P)	1 3 5 6
003	Remove, replace, & adjust fuel injection systems & components (P)	1 3 5 6
004	Identify governor types & operating principles (C)	1 3 5 6
005	Troubleshoot governors (P)	1 3 5 6
006	Remove, repair or replace, & adjust governors (P)	1 3 5 6

07.0 GASOLINE ENGINE COMPONENTS RECONDITIONING

001	Explain the basic principles of the operation of the 4-stroke cycle gasoline engine (C)	1	3	6
002	Identify engine assemblies & systems (C)	1	3	6
003	Diagnose valve & head problems by use of the visual inspection method (P)	1	3	6
004	Diagnose valve & head problems by use of the compression tester method or cylinder air pressure method (P)	1	3	6
005	Diagnose valve & head problems by use of the stethoscope method (P)	1	3	6
006	Disassemble engine (P)	1	3	6
007	Clean & inspect head for cracks, warpage, & valve guides (P)	1	3	6
008	Inspect valves for warpage, burns, cracks, stem wear, tip wear, & valve seat (P)	1	3	6
009	Grind valve seats & reface valves (P)	1	3	6
010	Check & inspect springs for free height, distortion, & installed height (P)	1	3	6
011	Adjust valve lash (P)	1	3	6
012	Remove & inspect camshaft bearings & lifters (P)	1	3	6
013	Time valve drive assembly (P)	1	3	6
014	Remove piston from rod assembly (P)	1	3	6
015	Measure out-of-round & cylinder taper with dial bore gauge (P)	1	3	6

016	Check piston pin & boss for wear (P)	1	3	6
017	Measure piston ring lands width, out-of-round, & taper (P)	1	3	6
018	Measure piston ring gap in cylinder bore (P)	1	3	6
019	Install & fit piston pin (P)	1	3	6
020	Check rod & piston assembly alignment (P)	1	3	6
021	Remove & replace rod bearing (P)	1	3	6
022	Hone cylinder & clean (P)	1	3	6
023	Install rings on piston (P)	1	3	6
024	Measure & check crankshaft with micrometer (P)	1	3	6
025	Check bearing bore with telescoping gauge (P)	1	3	6
026	Reassemble engine using plastic gauge (P)	1	3	6
027	Install oil seals (P)	1	3	6
028	Check for end play (P)	1	3	6

08.0 DIESEL ENGINE COMPONENTS RECONDITIONING

001	Explain the basic principles of the operation of the 4-stroke cycle diesel engine (C)	1	3	6
002	Identify engine assemblies & systems (C)	1	3	6
003	Diagnose valve & head problems by use of the visual inspection method (P)	1	3	6
004	Diagnose valve & head problems by use of the compression tester method or cylinder air pressure method (P)	1	3	6

005	Diagnose valve & head problems by use of the stethoscope method (P)	1	3	6
006	Disassemble engine (P)	1	3	6
007	Clean & inspect head for cracks, warpage, & injector sleeves (P)	1	3	6
008	Inspect valves for warpage, burns, cracks, stem wear, tip wear, & valve seat (P)	1	3	6
009	Grind valve seats & reface valves (P)	1	3	6
010	Check & inspect springs for free height, distortion, & installed height (P)	1	3	6
011	Adjust valve lash (P)	1	3	6
012	Remove & inspect camshaft bearings & lifters (P)	1	3	6
013	Time valve drive assembly (P)	1	3	6
014	Remove piston from rod assembly (P)	1	3	6
015	Measure out-of-round & cylinder taper with dial bore gauge or micrometer (P)	1	3	6
016	Check piston pin & boss for wear (P)	1	3	6
017	Measure piston ring lands width, out-of-round, & taper (P)	1	3	6
018	Measure piston ring gap in cylinder bore (P)	1	3	6
019	Install & fit piston pin (P)	1	3	6
020	Check rod & piston assembly alignment (P)	1	3	6
021	Remove & replace rod bearing (P)	1	3	6
022	Hone cylinder & clean (P)	1	3	6
023	Install rings on piston (P)	1	3	6
024	Measure & check crankshaft with micrometer (P)	1	3	6

025	Check bearing bore with telescoping gauge (P)	1	3	6
026	Reassemble engine using plastic gauge (P)	1	3	6
027	Install oil seals (P)	1	3	6
028	Check for end play (P)	1	3	6

09.0 POWER TRAIN MAINTENANCE

001	Identify power train operating principles & components (C)	1	3	6
002	Troubleshoot power trains (P)	1	3	6
003	Recondition clutches (P)	1	3	6
004	Recondition standard transmissions (P)	1	3	6
005	Recondition automatic transmissions (P)	1	3	6
006	Recondition differentials & final drives (P)	1	3	6
007	Recondition drive lines (P)	1	3	6
008	Recondition power take-offs (P)	1	3	6
009	Recondition transfer cases (P)	1	3	6

10.0 BRAKE SYSTEMS MAINTENANCE

001	Identify air brake principles & components (C)	1	3	6
002	Identify hydraulic brake principles & components (C)	1	3	6
003	Identify parking brake principles & components (C)	1	3	6
004	Troubleshoot brake systems (P)	1	3	6

005	Service & recondition hydraulic brake systems (P)	1	3	6
006	Service & recondition air brake systems (P)	1	3	6
007	Service & recondition engine brakes (P)	1	3	6
008	Service & recondition parking brakes (P)	1	3	6

11.0 CHASSIS MAINTENANCE

001	Recondition conventional steering systems (P)	1	3	6
002	Recondition hydraulic steering systems (P)	1	3	6
003	Recondition rear axle suspensions (P)	1	3	6
004	Recondition front axle suspensions (P)	1	3	6
005	Service wheels, bearings, hubs, & seals (P)	1	3	6
006	Service tires (P)	1	3	6
007	Recondition fifth wheels (P)	1	3	6

12.0 HYDRAULIC SYSTEMS DIAGNOSTICS & REPAIR

001	Identify basic principles of hydraulics (C)	1	3	6
002	Identify operating components of hydraulic systems (C)	1	3	6
003	Locate & match hydraulic units by their symbols on a diagram (P)	1	3	6
004	Troubleshoot hydraulic circuits using test equipment (P)	1	3	6

005	Maintain hydraulic fluid, filters, lines, & reservoirs (P)	1	3	6
006	Recondition hydraulic pumps & motors (P)	1	3	6
007	Recondition control valves (P)	1	3	6
008	Recondition hydraulic cylinders (P)	1	3	6
009	Recondition hydraulic accessories (P)	1	3	6

13.0 AIR CONDITIONING & HEATING SYSTEMS MAINTENANCE & REPAIR

001	Inspect & pressure test a basic A/C system (P)	1	3	6
002	Inspect, remove, & replace compressor belts (P)	1	3	6
003	Discharge, evacuate, & charge a basic A/C system (P)	1	3	6
004	Leak test a basic A/C system (P)	1	3	6
005	Service A/C electrical circuits (P)	1	3	6
006	Service vacuum circuits (P)	1	3	6
007	Diagnose basic A/C system problems (P)	1	3	6
008	Remove & replace components in basic A/C systems (P)	1	3	6
009	Remove & replace engine fan clutches (P)	1	3	6
010	Service air conditioning systems (P)	1	3	6
011	Service heating systems (P)	1	3	6
012	Remove & replace blower motors (P)	1	3	6
013	Diagnose heater malfunctions (P)	1	3	6
014	Remove & replace heater cores, control units, & cables (P)	1	3	6

14.0 EMPLOYABILITY SKILLS

001	List sources of job openings other than public or private employment agencies (P)	1 2 3 4 5 6
002	Write a letter of application for a job (P)	1 2 3 4 5 6
003	Prepare a resume or personal fact sheet (P)	1 2 3 4 5 6
004	List factors to consider when applying for a job (P)	1 2 3 4 5 6
005	List ways of making contact with employers (P)	1 2 3 4 5 6
006	Identify documents which may be required when applying for a job interview (C)	1 2 3 4 5 6
007	Complete a job application form correctly (P)	1 2 3 4 5 6
008	Identify appropriate dress & grooming for a job interview (C)	1 2 3 4 5 6
009	Classify behaviors considered to be appropriate or inappropriate in a job interview situation (C)	1 2 3 4 5 6
010	Describe the advantages to the employer & employee of being a productive worker (C)	1 2 3 4 5 6
011	Explain the purpose of supervision, self-discipline, & performance evaluation (C)	1 2 3 4 5 6
012	Identify appropriate response(s) to criticism from employer, supervisor, or other employees (C)	1 2 3 4 5 6
013	List consequences of frequently being absent from the job (P)	1 2 3 4 5 6
014	List consequences of frequently arriving late for work (P)	1 2 3 4 5 6
015	List factors to consider when resigning from a job (P)	1 2 3 4 5 6

016	Write a letter of resignation (P)	1 2 3 4 5 6
017	Exhibit a positive work attitude (P)	1 2 3 4 5 6
018	Practice good personal hygiene (P)	1 2 3 4 5 6
019	Qualify for the written part of ASE certification (C)	1 2 3 4 5 6

KEY

(C) Cognitive

(P) Performance

DRAFT RECOMMENDATIONS AS OF 1/1/86

CURRICULUM FRAMEWORK PROGRAM AREA: Industrial

FLORIDA DEPARTMENT OF EDUCATION EFFECTIVE DATE: July, 1986

PROGRAM TITLE: Diesel Engine Mechanics

CODE NUMBER: Secondary 8742000 Postsecondary _____

Florida CIP IN47.060500

SECONDARY SCHOOL CREDITS x COLLEGE CREDITS _____ POSTSECONDARY ADULT VOCATIONAL CREDITS _____

APPLICABLE LEVELS(S): 7-9 9-12 Postsecondary Adult Vocational

Postsecondary Vocational x Other 10-12, 21

CERTIFICATION COVERAGE: DESEL MECH 7

I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as diesel mechanics (625.281-010) or diesel engine mechanic helpers (625.684-010).

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, and maintaining, troubleshooting, and repairing diesel engines used in industry. Graduates of this program will be prepared to enter advanced postsecondary training in heavy duty truck and bus mechanics and heavy equipment mechanics.

II. LABORATORY ACTIVITIES: Shop or laboratory activities are an integral part of this program and provide instruction in the tools, diagnostic equipment, and test equipment. The materials and processes used in the laboratory are similar to those used in industry. Graduates will be able to use the various tools and precision equipment found in general use throughout the diesel mechanics industry.

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization for providing leadership training experiences and for reinforcing specific vocational skills. When provided, these activities are considered an integral part of this instructional program.

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills, and tasks relevant to the occupation the student has chosen as a career goal.

When the cooperative education method of instruction is used, the program length for the secondary-level program may be increased by a maximum of 2.0 credits.

The typical length of this program for the average achieving student is 900 contact hours (1080 clock hours).

IV. INTENDED OUTCOMES: After sucessfully completing this program, the individual will be able to:

01. Perform diesel trade skills
02. Apply electrical principles
03. Apply electronic principles
04. Maintain and repair diesel engines
05. Maintain and repair electrical systems
06. Recondition diesel fuel injection systems
07. Recondition diesel engine components
08. Overhaul diesel engines (2-stroke and 4-stroke cycle engines such Caterpillar, Cummins, Detroit, Mack, etc.)
09. Perform diesel engine preventive maintenance (PM)
10. Demonstrate employability skills

STUDENT PERFORMANCE STANDARDS

DIESEL ENGINE MECHANICS

01.0 PERFORM DIESEL TRADE SKILLS—The student will be able to:

01.001 Follow safety practices
01.002 Apply basic math skills
01.003 Apply intermediate math skills
01.004 Recognize, identify, and make metric conversions
01.005 Perform basic welding skills
01.006 Use hand tools
01.007 Use power tools
01.008 Use measuring and precision tools
01.009 Identify types of bearings and seals
01.010 Identify power train components and functions
01.011 Identify threaded fasteners by size, type, thread series, thread classes, material hardness, and compatibility
01.012 Read and use parts manuals
01.013 Read, interpret, and apply service manuals

02.0 APPLY ELECTRICAL PRINCIPLES—The student will be able to:

02.001 Identify the nature of electricity

02.002 Analyze electrical circuits

02.003 Define Ohm's and Kirchhoff's laws

02.004 Identify magnetism and electromagnetic induction

02.005 Identify applications of alternating current

02.006 Identify principles of DC motors and generators

02.007 Identify principles of AC motors

02.008 Locate and match electrical units by their symbols on a wiring diagram

02.009 Set up and use voltmeters, ammeters, and ohmmeters

03.0 APPLY ELECTRONIC PRINCIPLES—The student will be able to:

03.001 Identify principles of diodes and rectifiers

03.002 Identify principles of voltage regulation and power supply circuits

03.003 Identify principles of transistors

03.004 Identify principles of the silicon controlled rectifier (SCR)

03.005 Identify components of electronic systems and their functions

04.0 MAINTAIN AND REPAIR DIESEL ENGINES—The student will be able to:

04.001 Identify diesel engine operating principles (2- and 4-stroke cycle engines)

04.002 Identify components of 2- and 4-stroke cycle engines

04.003 Troubleshoot and repair cooling systems

04.004 Troubleshoot and repair lubrication systems

04.005 Troubleshoot and repair induction and exhaust systems

05.0 MAINTAIN AND REPAIR ELECTRICAL SYSTEMS--The student will be able to:

05.001 Test and service batteries

05.002 Test and repair starting systems

05.003 Test and repair DC charging systems

05.004 Test and repair AC charging systems

05.005 Test and repair ignition systems

05.006 Test and repair lighting and accessories systems

05.007 Test and service instruments and gauges

06.0 RECONDITION DIESEL FUEL INJECTION SYSTEMS--The student will be able to:

06.001 Identify fuel injection systems principles and components

06.002 Troubleshoot fuel injection systems and components

06.003 Remove, replace, and adjust fuel injection systems and components

06.004 Identify governor types and operating principles

06.005 Troubleshoot governors

06.006 Remove, repair or replace, and adjust governors

07.0 RECONDITION DIESEL ENGINE COMPONENTS--The student will be able to:

07.001 Explain the basic principles of the operation of the 4-stroke cycle diesel engine

07.002 Identify engine assemblies and systems

07.003 Diagnose valve and head problems by use of the visual inspection method

07.004 Diagnose valve and head problems by use of the compression tester method or cylinder air pressure method

07.005 Diagnose valve and head problems by use of the stethoscope method

07.006 Disassemble engines

07.007 Clean and inspect heads for cracks, warpage, and injector sleeves

07.008 Inspect valves for warpage, burns, cracks, stem wear, tip wear, and valve seat

07.009 Grind valve seats and reface valves

07.010 Check and inspect springs for free height, distortion, and installed height

07.011 Adjust valve lash

07.012 Remove and inspect camshaft bearings and lifters

07.013 Time valve drive assemblies

07.014 Remove pistons from rod assemblies

07.015 Measure out-of-round and cylinder taper with a dial bore gauge or micrometer

07.016 Check piston pins and boss for wear

07.017 Measure piston ring lands width, out-of-round, and taper

07.018 Measure the piston ring gap in a cylinder bore

07.019 Install and fit piston pins

07.020 Check rod and piston assembly alignment

07.021 Remove and replace rod bearings

07.022 Hone and clean cylinders

07.023 Install rings on pistons

07.024 Measure and check crankshafts with a micrometer

07.025 Check the bearing bore with a telescoping gauge

07.026 Reassemble engines using a plastic gauge

07.027 Install oil seals

07.028 Check for end play

08.0 OVERHAUL DIESEL ENGINES (2-STROKE AND 4-STROKE CYCLE ENGINES SUCH AS CATERPILLAR, CUMMINS, DETROIT, MACK, ETC.)—The student will be able to:

08.001 Troubleshoot and diagnose engine problems

08.002 Remove and install electrical equipment

08.003 Recondition turbochargers, blowers, and superchargers

08.004 Recondition cooling systems

08.005 Recondition intake and exhaust manifolds

08.006 Recondition fans, vibrator dampers, and front pulleys

08.007 Recondition air compressors

08.008 Recondition flywheels

08.009 Recondition flywheel housings

08.010 Recondition lubrication systems

08.011 Recondition front covers

08.012 Remove and install fuel systems

08.013 Recondition cylinder heads

08.014 Recondition cylinder sleeves and pistons

08.015 Recondition camshafts and accessory drives

08.016 Recondition crankshafts

08.017 Recondition cylinder blocks

08.018 Perform dynamometer tests

09.0 PERFORM DIESEL ENGINE PREVENTIVE MAINTENANCE (PM)--The student will be able to:

09.001 Perform PM inspection "A"

09.002 Perform PM inspection "B"

09.003 Perform PM inspection "C"

10.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

10.001 List sources of job openings other than public or private employment agencies

10.002 Write a letter of application for a job

10.003 Prepare a resume or personal fact sheet

10.004 List factors to consider when applying for a job

10.005 List ways of making contact with employers

10.006 Identify documents which may be required when applying for a job interview

10.007 Complete a job application form correctly

10.008 Identify appropriate dress and grooming for a job interview

10.009 Classify behaviors considered to be appropriate or inappropriate in a job interview situation

10.010 Describe the advantages to the employer and employee of being a productive worker

10.011 Explain the purpose of supervision, self-discipline, and performance evaluation

10.012 Identify appropriate response(s) to criticism from employer, supervisor, or other employees

10.013 List consequences of frequently being absent from the job

10.014 List consequences of frequently arriving late for work

10.015 List factors to consider when resigning from a job

10.016 Write a letter of resignation

10.017 Exhibit a positive work attitude

10.018 Practice good personal hygiene

10.019 Qualify for the written part of ASE certification

DRAFT RECOMMENDATIONS AS OF 1/1/86

CURRICULUM FRAMEWORK PROGRAM AREA: Industrial

FLORIDA DEPARTMENT OF EDUCATION EFFECTIVE DATE: July, 1986

PROGRAM TITLE: Heavy Duty Truck and Bus Mechanics

CODE NUMBER: Secondary _____ Postsecondary DIM0991

Florida CIP IN47.060501

SECONDARY SCHOOL CREDITS _____ COLLEGE CREDITS _____ POSTSECONDARY ADULT VOCATIONAL CREDITS _____

APPLICABLE LEVELS(S): ___7-9 ___9-12 ____ Postsecondary Adult Vocational

___Postsecondary Vocational _X_Other _____13-17_____

CERTIFICATION COVERAGE: DESEL MECH 7

I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as diesel mechanics (625.281-010), diesel mechanic helpers (625.684-010), preventive maintenance mechanics (620.281-050), electrical system specialists (825.281-022), fuel injection specialists (625.281-022), and truck and bus mechanics (625.281-010), or to provide supplemental training for persons previously or currently employed in these occupations.

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and

efficient work practices, and the development of diesel trade skills to repair engines, operating systems, and chassis of heavy trucks and buses.

II. LABORATORY ACTIVITIES: Shop or laboratory activities are an integral part of this program and provide instruction in tools, diagnostic equipment, and test equipment. The materials and processes used in the laboratory are similar to those used in industry. Graduates will be able to use the various tools and precision equipment found in general use throughout the heavy truck and bus mechanics industry.

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization for providing leadership training experiences and for reinforcing specific vocational skills. When provided, these activities are considered an integral part of this instructional program.

In various cases, students must be trained to troubleshoot and repair in specialtity areas such as Caterpillar diesel mechanics, Cummins diesel mechanics, Detroit diesel mechanics, IHC diesel mechanics, or Mack diesel mechanics.

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan which includes instructional objectives and a list of on-the-job and in-school

learning experiences; a work station which reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal.

In accordance with Section 240.149 F.S., the minimum basic skills grade level required for the postsecondary adult vocational program is: Mathematics 7.0, Language 7.0. This grade level number corresponds to a grade equivalent score obtained on a state designated basic skills examination.

The typical length of this program for the average achieving student is 1800 contact hours (2160 clock hours).

IV. INTENDED OUTCOMES: After sucessfully completing this program, the individual will be able to:

01. Perform diesel trade skills
02. Apply electrical principles
03. Apply electronic principles
04. Maintain and repair gasoline and diesel engines
05. Maintain and repair electrical systems
06. Recondition diesel fuel injection systems
07. Recondition gasoline engine components
08. Recondition diesel engine components
09. Maintain and repair power train systems and components
10. Maintain and repair brake systems

11. Maintain and repair chassis components
12. Maintain and repair hydraulic systems
13. Maintain and repair air conditioning and heating systems
14. Demonstrate employability skills

STUDENT PERFORMANCE STANDARDS

HEAVY DUTY TRUCK AND BUS MECHANICS

01.0 PERFORM DIESEL TRADE SKILLS—The student will be able to:

01.001 Follow safety practices
01.002 Apply basic math skills
01.003 Apply intermediate math skills
01.004 Recognize, identify, and make metric conversions
01.005 Perform basic welding skills
01.006 Use hand tools
01.007 Use power tools
01.008 Use measuring and precision tools
01.009 Identify types of bearings and seals
01.010 Identify power train components and functions
01.011 Identify threaded fasteners by size, type, thread series, thread classes, material hardness, and compatibility
01.012 Read and use parts manuals
01.013 Read, interpret, and apply service manuals

02.0 APPLY ELECTRICAL PRINCIPLES—The student will be able to:

02.001 Identify the nature of electricity

02.002 Analyze electrical circuits

02.003 Define Ohm's and Kirchhoff's laws

02.004 Identify magnetism and electromagnetic induction

02.005 Identify applications of alternating current

02.006 Identify principles of DC motors and generators

02.007 Identify principles of AC motors

02.008 Locate and match electrical units by their symbols on a wiring diagram

02.009 Set up and use voltmeters, ammeters, and ohmmeters

03.0 APPLY ELECTRONIC PRINCIPLES—The student will be able to:

03.001 Identify principles of diodes and rectifiers

03.002 Identify principles of voltage regulation and power supply circuits

03.003 Identify principles of transistors

03.004 Identify principles of the silicon controlled rectifier (SCR)

03.005 Identify components of electronic systems and their functions

04.0 MAINTAIN AND REPAIR GASOLINE AND DIESEL ENGINES—The student will be able to:

04.001 Identify gasoline and diesel engine operating principles (2- and 4-stroke cycle engines)

04.002 Identify components of 2- and 4-stroke cycle engines

04.003 Troubleshoot and repair cooling systems

04.004 Troubleshoot and repair lubrication systems

04.005 Troubleshoot and repair induction and exhaust systems

05.0 MAINTAIN AND REPAIR ELECTRICAL SYSTEMS—The student will be able to:

05.001 Test and service batteries

05.002 Test and repair starting systems

05.003 Test and repair DC charging systems

05.004 Test and repair AC charging systems

05.005 Test and repair ignition systems

05.006 Test and repair lighting and accessories systems

05.007 Test and service instruments and gauges

06.0 RECONDITION DIESEL FUEL INJECTION SYSTEMS—The student will be able to:

06.001 Identify fuel injection systems principles and components

06.002 Troubleshoot fuel injection systems and components

06.003 Remove, replace, and adjust fuel injection systems and components

06.004 Identify governor types and operating principles

06.005 Troubleshoot governors

06.006 Remove, repair or replace, and adjust governors

07.0 RECONDITION GASOLINE ENGINE COMPONENTS—The student will be able to:

07.001 Explain the basic principles of the operation of the 4-stroke cycle gasoline engine

07.002 Identify engine assemblies and systems

07.003 Diagnose valve and head problems by use of the visual inspection method

07.004 Diagnose valve and head problems by use of the compression tester method or cylinder air pressure method

07.005 Diagnose valve and head problems by use of the stethoscope method

07.006 Disassemble engines

07.007 Clean and inspect heads for cracks, warpage, and valve guides

07.008 Inspect valves for warpage, burns, cracks, stem wear, tip wear, and valve seat

07.009 Grind valve seats and reface valves

07.010 Check and inspect springs for free height, distortion, and installed height

07.011 Adjust valve lash

07.012 Remove and inspect camshaft bearings and lifters

07.013 Time valve drive assemblies

07.014 Remove pistons from rod assemblies

07.015 Measure out-of-round and cylinder taper with a dial bore gauge

07.016 Check piston pins and boss for wear

07.017 Measure piston ring lands width, out-of-round, and taper

07.018 Measure the piston ring gap in a cylinder bore

07.019 Install and fit piston pins

07.020 Check rod and piston assembly alignment

07.021 Remove and replace rod bearings

07.022 Hone and clean cylinders

07.023 Install rings on pistons

07.024 Measure and check crankshafts with a micrometer

07.025 Check the bearing bore with a telescoping gauge

07.026 Reassemble engines using a plastic gauge

07.027 Install oil seals

07.028 Check for end play

08.0 RECONDITION DIESEL ENGINE COMPONENTS—The student will be able to:

08.001 Explain the basic principles of the operation of the 4-stroke cycle diesel engine

08.002 Identify engine assemblies and systems

08.003 Diagnose valve and head problems by use of the visual inspection method

08.004 Diagnose valve and head problems by use of the compression tester method or cylinder air pressure method

08.005 Diagnose valve and head problems by use of the stethoscope method

08.006 Disassemble engines

08.007 Clean and inspect heads for cracks, warpage, and injector sleeves

08.008 Inspect valves for warpage, burns, cracks, stem wear, tip wear, and valve seat

08.009 Grind valve seats and reface valves

08.010 Check and inspect springs for free height, distortion, and installed height

08.011 Adjust valve lash

08.012 Remove and inspect camshaft bearings and lifters

08.013 Time valve drive assemblies

08.014 Remove pistons from rod assemblies

08.015 Measure out-of-round and cylinder taper with a dial bore gauge or micrometer

08.016 Check piston pins and boss for wear

08.017 Measure piston ring lands width, out-of-round, and taper

08.018 Measure the piston ring gap in a cylinder bore

08.019 Install and fit piston pins

08.020 Check rod and piston assembly alignment

08.021 Remove and replace rod bearings

08.022 Hone and clean cylinders

08.023 Install rings on pistons

08.024 Measure and check crankshafts with a micrometer

08.025 Check the bearing bore with a telescoping gauge

08.026 Reassemble engines using a plastic gauge

08.027 Install oil seals

08.028 Check for end play

09.0 MAINTAIN AND REPAIR POWER TRAIN SYSTEMS AND COMPONENTS

—The student will be able to:

09.001 Identify power train operating principles and components

09.002 Troubleshoot power trains

09.003 Recondition clutches

09.004 Recondition standard transmissions

09.005 Recondition automatic transmissions

09.006 Recondition differentials and final drives

09.007 Recondition drive lines

09.008 Recondition power take-offs

09.009 Recondition transfer cases

10.0 MAINTAIN AND REPAIR BRAKE SYSTEMS—The student will be able to:

10.001 Identify air brake principles and components

10.002 Identify hydraulic brake principles and components

10.003 Identify parking brake principles and components

10.004 Troubleshoot brake systems

10.005 Service and recondition hydraulic brake systems

10.006 Service and recondition air brake systems

10.007 Service and recondition engine brakes

10.008 Service and recondition parking brakes

11.0 MAINTAIN AND REPAIR CHASSIS COMPONENTS—The student will be able to:

11.001 Recondition conventional steering systems

11.002 Recondition hydraulic steering systems

11.003 Recondition rear axle suspensions

11.004 Recondition front axle suspensions

11.005 Service wheels, bearings, hubs, and seals

11.006 Service tires

11.007 Recondition fifth wheels

12.0 MAINTAIN AND REPAIR HYDRAULIC SYSTEMS—The student will be able to:

12.001 Identify basic principles of hydraulics

12.002 Identify operating components of hydraulic systems

12.003 Locate and match hydraulic units by their symbols on a diagram

12.004 Troubleshoot hydraulic circuits using test equipment

12.005 Maintain hydraulic fluid, filters, lines, and reservoirs

12.006 Recondition hydraulic pumps and motors

12.007 Recondition control valves

12.008 Recondition hydraulic cylinders

12.009 Recondition hydraulic accessories

13.0 MAINTAIN AND REPAIR AIR CONDITIONING AND HEATING SYSTEMS

—The student will be able to:

13.001 Inspect and pressure test a basic A/C system

13.002 Inspect, remove, and replace compressor belts

13.003 Discharge, evacuate, and charge a basic A/C system

13.004 Leak test a basic A/C system

13.005 Service A/C electrical circuits

13.006 Service vacuum circuits

13.007 Diagnose basic A/C system problems

13.008 Remove and replace components in basic A/C systems

13.009 Remove and replace engine fan clutches

13.010 Service air conditioning systems

13.011 Service heating systems

13.012 Remove and replace blower motors

13.013 Diagnose heater malfunctions

13.014 Remove and replace heater cores, control units, and cables

14.0 DEMONSTRATE EMPLOYABILITY SKILLS—The student will be able to:

14.001 List sources of job openings other than public or private employment agencies

14.002 Write a letter of application for a job

14.003 Prepare a resume or personal fact sheet

14.004 List factors to consider when applying for a job

14.005 List ways of making contact with employers

14.006 Identify documents which may be required when applying for a job interview

14.007 Complete a job application form correctly

14.008 Identify appropriate dress and grooming for a job interview

14.009 Classify behaviors considered to be appropriate or inappropriate in a job interview situation

14.010 Describe the advantages to the employer and employee of being a productive worker

14.011 Explain the purpose of supervision, self-discipline, and performance evaluation

14.012 Identify appropriate response(s) to criticism from employer, supervisor, or other employees

14.013 List consequences of frequently being absent from the job

14.014 List consequences of frequently arriving late for work

14.015 List factors to consider when resigning from a job

14.016 Write a letter of resignation

14.017 Exhibit a positive work attitude

14.018 Practice good personal hygiene

14.019 Qualify for the written part of ASE certification

INSTRUCTIONAL APPROACH

Local decisions must be made by school administrators & teachers concerning the appropriate methods to use to deliver instruction & measure student achievement. In many instances, a mix of various instructional approaches may be deemed appropriate to present instruction in a comprehensive and efficient manner. It is the teacher's responsibility to ensure that students learn how to competently perform the tasks specified in the course objectives. The teacher must lead the students through the learning experiences in a course. This leadership role requires the teacher to motivate students to aggressively pursue learning activities. The teacher must select the methods of instruction that best apply to the students ability levels and that allow the teacher to control the learning processes, to measure student achievement, and to provide feedback to the student.

KEY FACTORS TO CONSIDER

—Student Characteristics

Adolescent - Immature students need constant control, a high degree of motivational leadership, and relatively simple learning activities.

Adult - Mature students are more often self-motivated, need less control, and can accept complex learning activities.

Prerequisites - Can the student read, write, calculate mathmatics, and understand English language at the ability level required to complete learning activities.

—Teacher Characteristics

Subject Knowledge - The teacher must be a subject matter expert—must be able to teach instructional concepts and evaluate student performance. Should have significant amount of experience actually working in industry/vocational area.

Instructional Delivery - The teacher must motivate and lead the student as well as know how to organize and present various types of instruction. Innovative instructional methods should not be attempted if the instructor is not qualified to use them.

Instructional Development - Teachers must select materials, and often develop their own materials, to be used by students. The materials used must support the methods of delivery. The teacher must be qualified to select and develop course materials, or else use instructional packages developed by other qualified sources.

Instructional Measurement - Teachers must select testing methods that support the instructional delivery system used. Teachers must be qualified to develop, administer, and evaluate both written and performance type tests.

—Instructional Setting Characteristics

Time Constraints - Traditional methods of instruction in school systems are controlled by the time periods available. Instruction must be made to fit the time available for training unless the time constraints are removed. If time constraints are not a factor, innovative methods of instruction may be appropriate such as:

- open-entry/open-exit
- self-paced/independent study
- computer based instruction

- competency based instruction

Facilities and Equipment - Instructional methods selected must take into consideration the space available, the number of work stations for students and the amount of tools and equipment available for student use.

CONVENTIONAL INSTRUCTIONAL METHODS:

Any given course of instruction may require some instruction to be presented in a standard lecture or controlled demonstration format. These methods of instruction can be easily combined with instructor controlled step-by-step practical exercises. Some instructional activities may dictate that this instructional approach be used to introduce students to hazardous equipment often utilized in vocational training. In most situations, students should be required to perform specified activities to achieve skill competency. If mastery of a task is required, competency-based education methods may be more appropriate. If the training activity envolves an orientation or a seldom performed nonessential task, conventional instructional methods are acceptable.

COMPETENCY-BASED VOCATIONAL EDUCATION INSTRUCTIONAL METHODS:

The focus of Competency-based Vocational Education (CBVE) is to ensure that each student can competently perform tasks specified in an objective statement. Competency-based instruction can be included in conventional instructional settings as well as innovative settings. CBVE does not require self-paced/individualized methods of instructional delivery to be used as the only means for CBVE instruction.

CBVE PRINCIPLES AND CHARACTERISTICS

1. The curriculum is based on well defined, job related tasks or competencies. The curriculum should be designed to have students do things, not just read resources, or view AV materials.

2. Each period or unit of instruction contains a performance objective, stated in terms of observable, measurable activities.

3. Teachers provide students with a list of the performance objectives, the standards to be met and other performance criteria.

4. Teachers may utilize any appropriate method of instruction to present the subject matter to students. Teachers can mix various methods together in any given program, or course, or unit of instruction, to achieve the most efficient means for the students to learn the subject matter and competently perform the task as specified in the objective. Possible methods of instruction used in CBVE programs may include:

   —Group paced lectures and demonstrations.

   —Instructor controlled practice activities.

   —Self-paced instruction for individual learning activities and repeated practice.

   —Small group or team teaching methods where several students work together on a piece of equipment or a project, or activity.

5. Teachers must have a method of recording each student's achievement for each performance objective. This can be in the form of a record book, or a progress chart, a check off sheet, or a series of well planned performance tests.

6. Teachers must inform each student that they have either met the criteria specified for each performance objective or they have not adequately performed the task. The student must be informed of any inadequate performance and provided the opportunity and resources to practice performing the task until adequate performance is attained. This is probably the most difficult aspect of managing CBVE instruction, for it requires the teacher to individually coach or tutor a student for a controlled period of time, requiring the student to practice performing the task several times, and ultimately making the decision that the student is either competent at the task or not competent. The teacher may limit the time allowed for repeated task practice.

7. Student performance is evaluated in comparison to the standards and performance criteria stated in the objective, not to the performances of other students. If performance meets the standard, the student passes the objective 100%. If the student does not meet all the criteria specified, the student is not 100% competent in performance of the task and should not be given credit for completing the task. The student can be given an incomplete grade if continued attempts will be made to pass the objective.

8. Teachers may use both performance tests and written tests to determine competency. Written tests can be used to measure knowledge of performance procedures, equipment identification, math and science abilities, etc. Performance tests can be used for actual student performance of a task, to a prescribed standard, under specified conditions.

CBVE GOALS

The goal of Competency-Based Vocational Education is to have all students reach the specified standard of competency. Instructional methods, quantity of instruction, and performance evaluation methods will vary according to the instructional situation. CBVE instruction allows for the use of a multitude of instructional resources and procedures, including individual self-paced units of instruction to allow the student to master the objective. This approach differs from traditional instruction in which all students use the same materials and spend the same amount of time in a course where student achievement is expected to vary—not the instructional approach.

TEACHER AND STUDENT ROLES IN CBVE

The requirements of competency-based vocational education have major implications for the roles that teachers and students perform and for the kinds of skills that teachers need. In competency-based settings, teachers must not only be dispensers of information; but they must also become managers of a variety of instructional resources that they select and use to tailor instruction to the needs of individual learners. Teachers spend

less time providing content information and much more time helping individuals master objectives. In a competency-based setting, the teacher may present some group instruction as well as develop alternative resources, and function as a tutor and a counselor, a diagnostician of learner needs, a prescriber of instructional experience, and an evaluator of competent performance.

The teacher in this setting has, then, a more complex, varied, and rewarding role than ever before. Teachers need to be able to design their course or programs around measureable, job-related skills and to ensure that these skills are, indeed, necessary for obtaining and keeping a job. They must be able to state objectives clearly and in a way that permits objective measurement. Teachers must be able to carry out this measurement in a way that accurately assesses student achievement and that exactly reflects what the competency really involves.

Teachers must also be able to adapt their instruction to individual learning needs so that each student can acquire the competencies (s)he needs. This ability to tailor instruction demands knowledge of a wide variety of individualization strategies, as well as skill in applying these strategies systematically.

A major assumption underlying CBVE is that students who are actively involved in carrying out their programs of study will learn more and retain more than students who passively accept information fed to them. Thus, an important part of the teacher's job is to encourage students to assume more and more responsibility for their own learning.

Because students are doing many different kinds of things, and because the teacher must coordinate the activities of all the students in a course, the

individual student's role inevitably involves more responsibility than it does in traditional settings.

Many of the basic management tasks that teachers formerly undertook by themselves-tasks such as record keeping, monitoring student progress, and monitoring the use of resources-must become the joint responsibility of teachers and students in a competency-based setting.

Some teachers worry that giving students more responsibility will result in a loss of teacher control. On the contrary, however, most teachers find that the have more control in a competency-based setting than in a traditional, group-oriented setting. The teacher has, after all, designed the system or environment in which students must operate; without the teacher there to manage the overall system, it would soon cease to function.

INSTRUCTIONAL CONCEPTS:

Instruction should be systematic and reflect program goals. A list of competencies and specific performance objectives with criterion-referenced measures should be used.

1. Program Plan

   The training program should progress in logical steps and provide for alternate sequences, where applicable.

2. Student training plan

   A training plan for each student should be used, indicating the student's training goal(s) and specific steps needed to meet each goal. Every student should be given a copy of his/her training plan.

3. Preparation Time

   Adequate time should be provided for teacher preparation and

program development and/or modification.

4. Teaching Load

   The instructor/student ratio and class contact hours should allow time for interaction on a small-group and a one-to-one basis.

5. Curriculum

   a. The specific competencies in the Career MAP Competency List should be included in each area of program-specific instruction. Additional competencies may be added to meet the needs of local employers. All additional competencies should be approved by the program advisory committee.

   b. Instructions on the legal aspects and responsibilities in areas such as Environmental Protection Agency regulations, safety regulations, OSHA regulations, and other appropriate requirements should be included in the curriculum. Instruction and practice in filling out work order forms, ordering parts or supplies, and basic record-keeping should be a part of the training program.

6. Student Progress

   A record of each student's progress should be maintained through use of the Career MAP or another type of Progress Chart. The record should indicate the competencies required for mastery and those competencies the student has mastered.

7. Performance Standards

   Instruction should be performance based, with an acceptable performace standard stated for each task. These standards should be shared with students and potential employers.

Students should demonstrate "hands on competency" or "mastery" of a competency before the instructor verifies the student's performance.

8. Safety Standards

Safety instruction must be given prior to shop work and be an integral part of the training program. A safety test must be included in the training program. Eye protection must be worn in any shop/lab area, when required.

9. Personal Characteristics

All training activities and instructional material should emphasize the importance of maintaining high personal characteristics. Employability skills training and evaluation should be integrated throughout the training program.

10. Provisions for Individual Difference

The training program should be structured in such a manner that students with different levels of cognitive and psychomotor skills can be accomodated.

11. Related Instruction

Instruction in related mathematics, communication, and interpersonal relations should be provided and coordinated with ongoing instruction in the training program. This instruction should be provided by a qualified instructor.

12. Testing

Both written and performance-based tests must be used to validate student competency. Students should be encouraged to take certification tests that are publicly recognized indicators of capabilities.

COURSE OUTLINE/SAMPLE LESSON PLAN

Units of instruction used by Vocational Education teachers must be correlated to the Curriculum Frameworks, and Student Performance Standards. The Curriculum Framework provides the basis for developing the course outline. Each school should utilize the resources and modules that apply to the scope of their program and the various methods of instruction their situation dictates.

Teachers may develop their individual course outlines using the resources and instructional material contained in the last section of this guide. They may also develop their own units of instruction as they feel may be necessary to meet the intended outcomes stipulated in the Curriculum Framework. The number and order of presentation of the modules can be varied to fit the objectives of the course.

For example, a school may elect to go into depth in only a few of the modules, or it may decide to cover a wider range of modules but in less depth. This program can be offered for a single semester or for two or more semesters, depending upon the local situation. A student should not be given credit for enrolling in the same component of instruction more than one time.

SAMPLE COURSE OUTLINE

Vocational teachers should prepare a comprehensive outline of subjects to study for each course they teach. Each student should be provided a copy of the course outline. Teachers may use any format they desire for the outline, and should include the following information on the course outline.

Recommended Course Outline Contents

1. Course name.
2. Course number (state directory number and/or local number).
3. Course start date or individual start date.
4. Identification of time periods for study if applicable.
5. Identification of place or room/facility for study or practical work.
6. Identification of teacher/instructor/assistants responsible for instruction and/or evaluation.
7. Identification of units or subjects to study (objectives) or competencies, etc., including Task # or Duty #.
8. Identification of primary resources or references available to study.
9. Identification of major practical exercise work, projects, or activities to perform.
10. Identification of major tests or examinations to be administered.

SAMPLE COURSE OUTLINE FORMAT

Course Name _____

Course Number _____

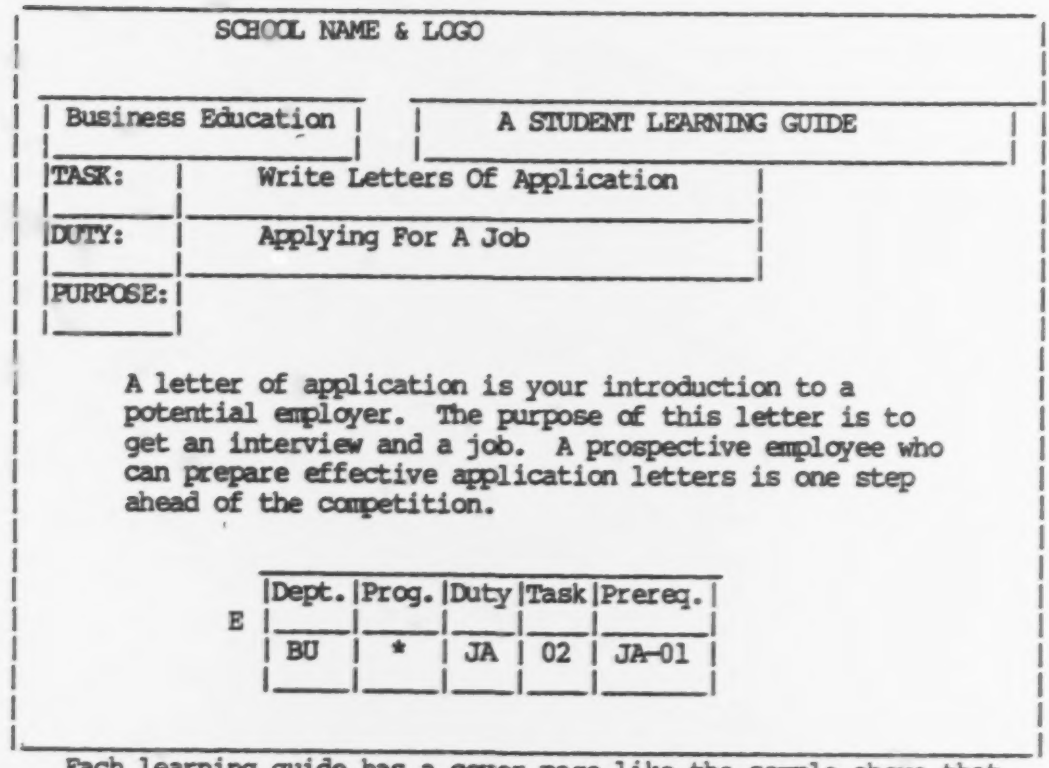
Course Dates _____

Instruction unit or period	Duty or Task # Module	Subject/ Objective/	location	Instructor	Reference

Lesson Plans/Teachers Guides & Student Guides

Teachers should prepare lesson plans or teachers guides & student guides for subjects on the course outline. Lesson plans are appropriate for traditional periods of instruction whereas teachers guides may be more appropriate for other types of instructional activities. Student learning guides may be used for traditional periods of instruction but they become a necessity for self-paced learning activities. Teachers guides contain all instructional information as well as tests & answer keys, whereas student learning guides contain only student information.

A sample student learning guide is provided in the following pages. This sample is an example of the material a teacher would provide students with for self-study in a competency-based course activity. Each page of the sample contains a different topic for the sake of illustration only. An actual student learning guide would be written around only one objective.



Each learning guide has a cover page like the sample above that contains the following items:

A. the name of the program

B. the task-a statement of exactly what you will be able to do or know when you complete the learning guide.

C. the duty-the broad unit in which this task is found.

D. the purpose-a statement of why it is important to attain the task.

E. identifying information such as department, program, duty, task, and prerequisite. The prequisite in the box on the far right tells you that you must have already attained the task identified there before proceeding to attain the one in the present learning guide.

STUDENT PERFORMANCE OBJECTIVES:

A TERMINAL PERFORMANCE OBJECTIVE:

B GIVEN: plans and a residential site.

C YOU WILL: construct and set forms for a continuous footing.

D HOW WELL: You must successfully complete the Written Test and score 100% on the Performance Test.

ENABLING OBJECTIVES:

1. Identify styles, uses and parts of forms.
2. Prepare for constructing continuous footings.
3. At a school work station, construct and set forms for a continuous footing.

E

Dept.	Prog.	Duty	Task
IN	9163	F	01

The student performance objective page, similar to the sample you see above, contains the following information:

A. the terminal performance objective (TPO)-the broad heading that encompasses the three items beneath it and states in detail what will be expected of you at the end of the learning guide

B. the given-a statement of what will be provided when you take the written or performance test

C. the you will-a statement of what will be required to attain the task

D. the how well-a statement of the degree of performance excellency required to attain the task

E. the enabling objectives (EO's)-the steps to be taken in attaining the task

A | ENABLING OBJECTIVE NO. _2_

B | Disassemble fuel injector and inspect parts.

C	LEARNING STEPS	RESOURCES
	1. Disassemble injector.	1. a. Needle valve injector b. Mechanic' tool set c. Injector tools
	2. When completed, evaluate your work using the Self-check.	2. Self-Check enclosed
	3. Have instructor evaluate your recordings.	3. Instructor
	4. Go on to Enabling Objective No.3.	

E

Dept.	Prog.	Duty	Task	EN.OBJ.
IN	9123	C	05	2

The enabling objectives are the heart of the learning guide. They provide detailed steps of what to do and when to do it.

There is an enabling objective page for each EO listed on the student performance objective page. The EO page resembles the sample above, and contains the following information:

A. the number of the EO being learned

B. a restatement of the EO as it appeared in the student performance objective

C. the learning steps-they tell you what to do

D. the resources-they tell you what items you will need to complete the steps

INSTRUCTION SHEET

Mounting Tires

Follow the procedure below for mounting a tire on a rim. Pay close attention to all safety precautions.

CAUTION: WEAR SAFETY GLASSES AT ALL TIMES!

1. Visually inspect tire for any wear or damage.
2. Place the rim on the changer with the narrowest flange up — hand tighten centering cone.
3. Lubricate bead of tire with soap solution.
4. Place tire in position on the rim with as much bead over the rim flange as possible. This provides a starting position for bead lifting tool.
5. Attach the air hose for inflating the tire.

CAUTION: KEEP THE HANDS AND BODY AWAY FROM TIRE WHILE INFLATING. IF THE TIRE SHOULD EXPLODE YOU COULD BE INJURED!

Dept.	Prog.	Duty	Task	En Obj
IN	9043	B	02	2

The procedure in using the EO page is to follow each learning step in sequence. The first several learning steps will tell you to read or view particular resources identified to the right of the step (see #2 on the sample EO page). Other learning steps will ask you to practice or apply the knowledge or skill (see #3 on the sample). Another learning step will identify the type of feedback used in evaluating the skill or knowledge called for in the EO. Often this is a self-check (see #4 on the sample). Some learning guides will have instruction sheets on the order of the above sample.

SELF-CHECK

DIRECTIONS

Evaluate your work using the items listed below. All items should receive a "yes" response.

	YES	NO
1. Was the stocked area layed out with a pencil and chalk line?.....	___	___
2. Did each end of the stock area begin with a stack of blocks?.....	___	___
3. Was the line hung on the left lead first?...	___	___
4. Was the line hung in 45 seconds?.....	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

Dept.	Prog.	Duty	Task	En Obj.
IN	9133	B	18	2

The self-check gives you immediate feedback on how well your learning is progressing.

WRITTEN TEST FOR TASK NO. ____

TASK: Demonstrate and use Ohm's Law

Directions

The purpose of this test is to determine if you fully understand how to demonstrate and use Ohm's Law. To successfully complete this test, all items must be answered correctly.

The items below are Multiple Choice. On the separate answer sheet, put the letter of the correct answer in the blank to the left of the number of the question.

Multiple Choice Question

____ 1. According to accepted theory, electric current is:
a. the electron at rest. c. the movement of atoms.
b. the flow of electrons. d. the movement of protons.

____ 2. The ohm is the unit of electrical:
a. current. c. pressure.
b. voltage. d. resistance.

Dept.	Prog.	Duty	Task
IN	9273	B	02

PERFORMANCE TEST FOR TASK NO._____

TASK: | Perform Cash Transactions

_____ _____
STUDENT'S NAME DATE

DIRECTIONS TO STUDENT: In a store situation, you will set up a till and place the currency in the proper place. You will be evaluated for attainment of this task, based upon the items listed below.

ITEM NO.	ITEMS TO BE EVALUATED: For successful attainment ALL items must receive a "YES" Response.	YES	NO	
1.	Were all bills placed in the proper slot?.....	...	..	.....
2.	Were all coins placed in the proper compartment?.	...	..	.....
3.	Was the work area cleaned?.....	...	..	.....

_____Score ___Attained
___Not Attained

Dept.	Prog.	Duty	Task	Attempt
DE	4623	C	03	

_____
EVALUATOR'S SIGNATURE

The performance test is always the last page of the learning guide. It may identify checkpoints of evaluation in the performance of skill, or it may list desirable characteristics of the finished product.

**Example of Student Learning Guides taken from : Learning at Ridge Vocational Technical Centers, State of Florida, Department of Education, Division of Vocational Education; June, 1980.

STUDENT ORGANIZATION PARTICIPATION

Vocational student organizations operate pursuant to federal and state laws, which authorize them as viable components of vocational education programs. According to federal regulations, the vocational education program of instruction may include activities of vocational student organizations which are an integral part of the vocational instruction offered and which are supervised by vocational education personnel. The Florida Board of Education Rules authorize vocational student organizations as an integral part of the vocational education program SBER 6A-6.64 (7) and 6A06.65 (8).

Vocational Student Organizations are operated throughout the Nation on the basis of legal endorsement, financial support, and active participation of federal, state and local levels of government as well as the civic and business communities.

Vocational Student Organization Activities are an integral part of the vocational curriculum in Florida. The organizations are designed to expand and enrich opportunities for leadership development, social awareness, civic responsibility, and vocational understanding.

Students who participate in the activities of a vocational student organization are better prepared to take their places in the world of work. They acquire firsthand knowledge of the many opportunities available in their chosen careers, and become aware of the value of their contributions

to society.

Vocational student organizations provide opportunities for members to participate in activities which relate to actual or anticipated employment. Students develop and utilize their talents and abilities in ways that otherwise could not be available to them.

Vocational Industrial Clubs of America (VICA)

The Vocational Industrial Clubs of America (VICA) is an organization for students enrolled in trade, industrial, technical, and health occupations in high schools, area vocational-technical centers, and junior and community colleges.

VICA promotes high standards in work ethics, craftmanship, scholarship, and saftey while it fosters a deep respect for the dignity of work. In addition, the precepts of VICA help students relate school experiences to their search for meaning, identity, and achievement. A great deal of emphasis is placed on the functions of labor and management organizations, their interdependence, and their importance.

VICA members learn and develop skills in many different trades, including building, automotive, mechanical, heavy equipment, and electrical. In addition, students in such personal service occupations as cosmetology may be a part of VICA.

Prestige and recognition are offered to the VICA member through a local, regional, state, national, and international program of competition and

awards. Opportunities to develop personal leadership skills are provided through workshops and seminars while competitive activities help to develop the students' perspectives.

Membership in VICA helps students learn to work together and prepare for life through a continuing emphasis on the importance of each person's role as a contributing member of American society.

What is VICA?

VICA is an organization for students enrolled in fulltime secondary or post-secondary trade, industrial, or technical occupations education programs. It is the only national (and international) organization for trade and industrial students.

VICA gives every member a chance to learn, to enjoy the interaction with other students, to assist their schools and communities, and to grow and mature in qualities necessary to meet the challenges of the life ahead of them. VICA members are no different from other students except that they have found a way to make their formal training and education an enjoyable and rewarding experience. They're "turned on" to the satisfaction, rewards, and fun they have found in VICA.

VICA is the students' organization; the goals, purposes, and activities that relate to their own personal career goals and life interests. VICA is for students with a definite future in mind—people who can think with their minds and work with their hands, people who are proud of their work they do and want to learn to do it better. VICA is for those who want to develop as

members of society, to learn to express themselves, to work with others, and to make contributions as individuals.

VICA is YOUR organization.
VICA is much more than contests.
VICA is training youth for leadership roles
within their schools and communities.
VICA is instilling in youth the importance of participation,
within their school, within their community and within the
student organization.
VICA is also participation in leadership and skill areas.
A good VICA program gives Industrial Education programs
high visibility.

Contests at the local-club level determine which students shall represent their school in regional competitions. Instructors should plan and conduct contests within their trade areas. This philosophy shall also prevail for leadership areas of emphasis. (Successful competitors at local school levels may, in school districts so desiring, compete within the district. THIS IS A SCHOOL DISTRICT OPTION.)

Successful competitors at the local school level compete at one of Florida's five regional contests. Successful competitors next compete at the state level. The state winners compete on the national level, in the United States Skill Olympics.

Competitors for the International Skill Olympics (ISO) are determined by a

combination of leadership and skill abilities. The International Skill Olympics Committee establishes all rules and guidelines for the ISO.

The following additional criteria will be used in the selection of International contestants:

a. Overall citizenship—as demonstrated by attitude toward school, occupation, VICA, additional training, etc.
b. Evaluation of progress in skills and knowledge of trade, metric applications, print reading, and layout of problem.
c. Personal desire to represent VICA and the United States in international competition.
d. Willingness to make a commitment to VICA as to purpose of organization, code of conduct, preparation time, etc.
e. Contestant's self-reliance, basic intelligence, ability to follow instruction, maintain schedules, and adapt to last-minute changes.

Local VICA Organization

1. School Club

   Each school is one club (with one charter). A "school" shall be defined as one that appears with an assigned number in the current Florida Directory.

2. Chapters

   In the event that a school has a multiple sessions, each session shall be identified as a "chapter" (example- morning session identified as chapter #1, afternoon session chapter #2, evening

session chapter #3, etc.).

3. Section

Each occupational program within each chapter shall be identified as a "section" (example- auto mechanics, welding, cosmetology, etc.).

Organizational Structure

Conducting a local club activity is the responsibility of every member. Every member must have a function to perform. A balanced organizational structure is necessary to equalize the workload as well as to pinpoint responsibility. When the students know what is expected of them, they can better use their abilities to plan and execute their own activities and , at the same time, grow in leadership ability. An effective organizational structure allows for the mixing of people and personalities, which is good human relations training.

It is a good idea to make a poster-size (or larger) organizational chart, to display it on the bulletin board, and to duplicate smaller copies of the chart so each member may have a copy. Members are less likely to shirk their responsibilities when all members are aware of everyone's assigned duties. Advisors must be careful to enforce the chain of command in all decisionmaking situations.

The national organizational structure shows the relationships of the local, state, and national organizations. It is important that every member understand just how the total organization functions. See VICA

Organizational Diagrams at Appendix B.

Intergrating VICA and Instruction

What is meant by the phrase "Integrating VICA and Instruction?" Some teachers feel that integrating VICA activities in between their instructional activities (in printing class, slotting VICA between a unit on the offset press and a unit on stripping) is best. Then there is always the teacher who says,"Look, nothing really happens Friday afternoons anyway, so I will slot VICA activities in on Friday afternoon. We will have our 5-minute VICA club meeting and that will satisfy the talk about integration of VICA activities into the instructional program."

This is not what we are talking about. We are talking about VICA being an integral part of everything that happens inside the classroom.

You may wish to secure and study the slide-tape program "Integrating VICA and Instruction" that is available from your Regional Program Consultant or Regional Program Advisor. You also may wish to purchase the set.

In-school instruction involves the organized presentation and application of knowledge, skills, and attitudes. Laboratory occupational experiences require the individual student to apply, in a simulated work setting, the knowledge, skills, and attitudes acquired through in-school instruction. VICA activities are part of in-school instruction and laboratory occupational experiences. Integrated club activities improve and tie together the existing curriculum.

VICA is specifically for Vocational Instruction Education. The activities of a chapter can be part of the learning experiences planned for any vocational class. Vocational education classes such as welding, foods, drafting, and auto mechanics can utilize VICA as a teaching tool. Any student who is enrolled in Vocational Industrial Education and meets membership requirements can be a member of a VICA club.

Job skills and procedures are often well defined and structured in the vocational programs. For example: in individual vocational courses, such skills as drawing to scale in drafting, tuning a motor in automobile mechanics, and keeping production records in a vocational printing course are taught. Although such skills are often taught at all levels in vocational education, the attitudes and values that promote employability and employment stability often are neglected parts of structured skill-oriented vocational programs. For example: learning experiences dealing with such activities as getting along with coworkers, accepting constructive criticism, or taking orders might not be as easily dealt with or integrated into skill-oriented, vocational courses. (See chart below.)

CLUB ACTIVITIES PROVIDE EXPERIENCE
THAT LEAD TO EMPLOYABLE
SKILLS AND ATTITUDES

1. Getting along with co-workers.
2. Respecting authority.

3. Accepting criticism.
4. Respecting the rights dignity of others.
5. Meeting deadlines.
6. Working with supervisors.
7. Taking directions.
8. Communicating clearly.
9. Taking initiative.
10. Being punctual.
11. Assuming responsibility.
12. _____
13. _____
14. _____

Being an Effective Advisor

The effective advisor believes in student-directed learning, is organized, and is flexible in planning. The effective advisor works to become a respected person in the community, thereby building support for VICA activities. The effective advisor blends the classroom world with the "working" world and associations, and involves students with business, professional, and community leaders. The effective advisor promotes enthusiasm. For these efforts, the effective advisor receives a lifetime of psychological rewards.

The following club/classroom activities from the teacher/advisor viewpoint,

should make being an advisor easier.

---

1. Advise and guide; do not dictate.
2. Positively assume that club activities are going to succeed. Know that club activities are strong teaching tools. Show enthusiasm.
3. Establish basic ground rules that help students to lead themselves. Hold meetings regularly and conduct meetings in a business-like manner.
4. Organize activities. Set up club files and a library of club-related materials.
5. Remember that club activities are individual and group activities and are NOT teacher activities.
6. Use students as class leaders.
7. Develop professional slide presentations about club work in classes.
8. Develop an informational packet to use with the community and other school personnel. Include such things as curriculum outlines, training plans, national headquarter promotions, calendars of work, etc.

Necessary Groundwork--Selling the VICA CLUB

Selling club activities to the department chairman, school administrators, and the community is an important first step in the organization of a club.

You may be told that there can be no clubs in the classroom and that few students join any more. Keep in mind that the VICA organization is not a club in the traditional sense. With ingenuity, a club can work in any situation in spite of rigid rules. Stress that VICA is INTEGRAL TO THE TOTAL PROGRAM AND SHOULD BE CONSIDERED A VERY IMPORTANT TEACHING TOOL IN AND OUT OF THE CLASSROOM/SHOP. Some suggestions on how to sell club-work are included below.

1. Discuss ideas. Don't spring the idea of an integrated club on people whose support will be needed.
2. Inform people about the state and national organizations by handing out and discussing promotional materials.
3. Make starting a VICA organization part of the agenda of the Craft Advisory Committee's meeting. Present your proposals to this group. Let the committee work with students to plan a program of activities.
4. Survey students on their interests in club activities. Compile and distribute results.
5. Check course outlines to see how club activities can fit in. Add these activities to lesson plans.
6. Relate the school philosophy to the national VICA Organization's goals, purposes, and program of activities.
7. Project the number of resource persons that students would contact in the community who would be up-to-date experts in certain areas.
8. Identify the club as an important public relations tool.
9. Show how club activities are important motivational projects

that promote student-directed learning.

10. If necessary, point out the benefits of club activities in relation to the relatively low cost-per-student.
11. Confer regularly with those in charge, i.e., department chairpersons, officers, and school administrators.

STUDENT ADMISSIONS CRITERIA

INTRODUCTION

Leading the individual student to successful completion of a vocational education program—in either a secondary or a post-secondary institution—should be the only major concern of a school's teaching effort. It is, therefore, of the utmost importance to direct thought, planning, and effort into identifying and selecting students with excellent potential for success in the educational program and in the industry. The school's primary task is to prepare people for full-time, entry-level positions as technicians or, in the case of those with more experience, as managers. Recruiting efforts will, of course, vary from school to school depending upon level (secondary or post-secondary), courses available, and local needs.

Students enrolled in an occupational cluster should be able to benefit from the instructional content therein with reasonable expectations for employment upon successful program completion.

In accordance with the Course Code Directory, an occupational program is offered to students at grade levels specified therein. The specific student admissions criteria required by the state and local education agencies are identified below.

SPECIFIC ADMISSIONS CRITERIA

	SECONDARY	POST-SECONDARY
Minimum age:	n/a	n/a
High School Diploma or GED Required:	no	yes
Physical Requirements:	none	none
Special Requirements:	none	none
* Minimum Basic Skills Math Level:	n/a	7.0
* Minimum Basic Skills Language Level:	n/a	7.0

*This grade level number is specified in the Curriculum Framework and is derived from a state basic skills examination.

In addition, attention should be focused on other personal qualities that, in theory, may be subject to improvement within a training program but, in reality, may prove to be serious impediments to success. Typical would be deficiencies in communications and mathematical skills. Such skills should be measured by tests and the results used as a screening guide or as a basis for providing additional program requirements.

THE STUDENT PROFILE

It is difficult to find an "ideal" student. Many will apply for a place in various training programs. The question is: How can students with the most potential for success be selected?

To attempt to draw a profile of the ideal student candidate would be

fruitless because the ideal candidate cannot be defined in a manner that would fit all localities, nor even in such a way as to fit all situations in a single locality. Nevertheless, it is appropriate for the Craft Advisory Committee and the school system to develop a profile as a basic guide, with the certain knowledge that supplying candidates at any given time will necessarily entail compromise.

Rejecting high school students requesting admission to a vocational program would probably not be permitted in any school system in the nation. Even if students could be screened, it would be difficult to determine which would be successful. In a high school program, it may be best to accept as many students as possible and let their abilities surface in the first year or two. It may then be possible to place the strongest students in a vocational "capstone" course in their senior year, either for employment upon graduation or as a necessary prelude to admission to a post-secondary program. Obviously, this is not a perfect solution; but in the real world, perfection is rare.

The community college should make a greater effort to enroll the "ideal" student. This may be done through a process of screening "all comers" or by consciously recruiting potential students with known qualifications. In either case, the school and the Craft Advisory Committee will need to draw a profile of the desirable student. The profile will contain a list of qualities, traits, and aptitudes that combine to make a potentially successful candidate. Since few of these qualities are completely missing in any one person, acceptable levels must also be determined. The qualities deserving of highest attention—mechanical aptitude, for example, or native

intelligence—are those which the educational program itself is unlikely to be able to change. Accordingly, such matters should carry considerable weight in establishing the basic profile. Other matters—deficiencies in mathematical or communications skills, for example—may lend themselves to improvement through related instruction, even though they are not parts of the training program per se. Following is a list of specific qualities the Advisory Committee and school staff should consider when establishing the student profile:

MECHANIC/TECHNICIAN—SERVICE

—Knowledge of basic tools and equipment used by mechanics/technicians
—Aptitude needed to think through and solve mechanical and technical problems;
—Ability to understand written mechanical/technical materials;
—Ability to interpret mechanical/technical drawings;
—Mechanical dexterity.

MECHANIC/TECHNICAL SERVICE MANAGEMENT

—Basic knowledge of service;
—Business skills;
—Ability to work with people;
—Communications skills;
—Leadership.

QUALIFYING AND PRETESTING

The process of qualifying a potential student for training must be an integral part of the recruiting process. Considerable amounts of time and money will be spent on students entering training. There must be some assurance that they are receptive to, and capable of benefitting from, the training that will be provided.

In the normal process of recruitment, recruiters will have some idea of the candidate's basic traits and capabilities. Whoever guides the candidate to the program will also have some knowledge of the person's interests, abilities, and experience. These perceptions should be considered by school admissions officials.

Care must be taken, however, to assure that highly favorable early-interview impressions—or negative impressions, for that matter—do not prejudice the final decision. Determination of the candidate's potential for success can be greatly aided by pre-school testing. Such tests can yield reliable clues to certain characteristics, such as mechanical aptitude, that are essential. The tests can also tell a great deal about the candidate's present knowledge and skills. These, in turn, can help determine how much and what kind of training each individual should receive.

Despite the efficacy of many tests, a caveat should be noted. Standardized testing has come under fire, in recent years, from many quarters. It has frequently been charged, for example, that some standardized tests are

culturally biased and, consequently, favor one group in society over another. Those charged with responsibility for admissions should be aware that testing, while it can often provide valuable insights, should never be the sole criterion for admissions.

COUNSELING AND GUIDANCE

Counseling is a two-fold activity. Its first use is to guide the qualified, prospective student into the program; its second is to help the enrolled student on a continuing basis throughout the program.

Entry into a program does not cause all student problems to vanish; each student will encounter new problems as the program unfolds. The counselor's job is to work with the student to help identify problems and then work toward their solution. The counselor must also constantly watch for signs of discouragement or loss of interest and attempt to determine their causes.

Much day-to-day counseling will necessarily fall to the teacher. The teacher has the most contact with the student and is often in a position to detect and correct a problem while it is small. Overlap of responsibility between teacher and counselor should be apparent. The importance of working together in this critical area cannot be overstated.

The professional counselor cannot be expected to have the expertise of the teacher. The teacher will therefore provide much of the counseling that focuses on trade knowledge and skills. The counselor, on the other hand, will focus on the student's needs for advice on related instruction and in

connection with personal growth, interests, and attitudes. In large programs, at least one counselor with deeper knowledge of the industry should be available.

STUDENT PLACEMENT

Placement will not be a factor with some students, such as those currently employed in the industry. A student from industry, even if in school by personal choice, is likely to have a good idea of where to go when the program is completed. The school placement program should, of course, be as available to these students as to anyone else.

The placement program, for the most part, will serve students who enter with little or no experience in, or contact with, the industry. Many such students will develop industry contacts during the course of instruction, particularly if a cooperative program is offered. It is logical to center placement activity at the school. The school has an organized placement office for other occupations.

The tasks of the placement official is to fit graduating students to job openings in the community. Identifying graduating students is a simple task, but the placement official will also need to know something of each student's personal aims and interests in addition to what is on the achievement record. The placement official should develop a form that will provide this information in simple format for easy reference. The placement official, the counselor, and the teacher should assist students in the preparation of effective resumes.

Input concerning employment openings is somewhat more difficult to organize. Such input must come from individual service establishments in the community. Each job listing should include as much detail as possible about the work involved. A standard form for this purpose will facilitate matching an applicant to a job.

The placement official should attempt to expose a given student to as many suitable job openings as possible. Conversely, employers should be exposed to as many qualified candidates as possible. The placement official should take special pains to avoid matching up an applicant and a job that are obviously not suited to each other.

The final fit of placing technicians in an appropriate job is the joint responsibility of the student and the employer. The success of this final decision will be greatly enhanced when both student and employer have numerous interview opportunities and as wide an area of choice as possible.

The role of the Craft Advisory committee in placement is two-fold:

—To work closely with the school in establishing an adequate placement function and to evaluate its performance on a continuing basis;

—To work closely with all industry establishments in the community to encourage them to use the school's placement office; to provide adequate job information to the placement

office; and to develop an effective procedure for interviewing and evaluating potential employees suggested by the school.

If the need for competent technicians is as great as claimed, and if the educational program performs in such a way as to produce qualified technicians, the failure of local service establishments to follow through with job listings and effective interviewing and hiring practices can seriously impair the ultimate success of the program. It is up to the Advisory Committee to make certain that student placement proceeds in a smooth and effective manner.

TEACHER CERTIFICATION AND QUALIFICATIONS

QUALIFICATIONS

The Teacher is qualified to teach by one of the following methods:

1. Regular or temporary Florida teacher's certificate with appropriate coverage;
2. Approval of local school board consistent with adopted school policy; or
3. Regular or temporary Florida teacher's certificate with other than appropriate coverage; has met all occupational experience requirements prescribed as a prerequisite to appropriate certification, and has been approved by the school board to teach out-of-field.

Refer to the Curriculum Framework for this program to determine the certification coverage for this program.

INSTRUCTIONAL STAFF

It is recommended that the instructional staff have technical competency and meet all state and local requirements for certification.

1. Technical Competency

   Instructor(s) sould have demonstrated technical competency and should hold current, nationally recognized certification in the laboratory areas taught. Instructors should hold current, nationally recognized certification, if awarded.

2. Instructional Certification

   Instructors should meet all state certifying requirements.

3. Technical Updating

   Faculty members should be provided technical materials required to maintain their competency. An opportunity should be provided for instructor(s) to return to industry on a regular basis for in-service and skill upgrading.

4. One or more instructor(s) in each department should hold a current American National Red Cross Standard First Aid Certificate.

5. Substitutes

   A systematic method of obtaining "substitute" or "supply" instructors should be used to assure instructional continuity. An orientation session for substitutes should be held on a regular basis. The substitute should be a competent instuctor in the occupational area and specific competencies taught.

FACILITY DESIGN CRITERIA

INTRODUCTION

Even the best instructor should not be expected to turn out competent and immediately productive graduates if they are forced to learn with out-of-date, improper, or inadequate facilities, tools, and equipment. Planning for and providing the proper facilities, tools, and equipment are difficult parts of establishing a training program, especially when space and budgetary constraints are considered. Facilities, tools, and equipment should be adequate to meet teaching objectives.

This section of the Program Guide contains guidance for setting up classroom activities as well as lab or shop facilities. Diagrams of typical classroom and shop layouts are contained in Appendix A.

REAL-LIFE FACILITIES

The training facility cannot duplicate the real-life facility in which the student will work after graduation. However, the more the school resembles the industrial environment, the easier it will be for the student to make the transition from school to work. Tools, supplies, and test equipment should conform to local industry usage. Although different facilities may utilize different makes of tools and equipment, the actual differences in operation of most equipment are usually not so great. The on-the-job training each graduate will inevitably receive will usually reconcile

differences between equipment used in the school and that in the commercial shop.

TEACHING FACILITIES

Additional facilities and equipment will be required that are peculiar to the teaching job itself. Among the more important are:

Classroom space;

Audio-Visual Equipment—motion picture, slide, filmstrip, and overhead projectors; videotape units; microfiche readers;

Special devices to demonstrate basic principles and theory;

Duplication of tools and appropriate equipment to enable several students to work individually on the same service operation;

"Live Work" area(s) or laboratory facilities.

A superior instructor could no doubt make do without much of this equipment. But the availability of state-of-the-art training devices enhances the effectiveness and efficiency of any classroom.

Efficiency means achieving instructional objectives in the shortest time possible. By reducing training time and lost motion, the "return on investment" of the facility increases, competent maintenance persons enter

the industry more quickly, and the individual student initiates a career and begins producing personal income sooner.

UPDATING FACILITIES

Facilities and equipment need updating just as curriculum, course content, and instructor capability do—and for the same reasons: technological change and improvements from year to year. Updating facilities and equipment may be more costly than updating course content—but failure to do so, at least minimally, will almost certainly impair the effectiveness of the program in a relatively short time.

DETAILED FACILITIES ANALYSIS

The advisory committee can assist the school in establishing priorities for installing facilities, tools, and equipment. Some are necessary; others are advantageous; and some can be considered nice to have, but essentially unnecessary. Careful planning and analysis of needs over several years can, however, lead to the establishment of a first-rate facility in almost any community.

FACILITIES ORGANIZATION

In planning adequate facilities, one of the more critical considerations—and one that is far too often underestimated—is providing adequate space to meet the changing needs of the instructional program. Buildings should be

designed and constructed for future expansion.

WORK STATION ARRANGEMENT

The arrangement of work stations and specialized equipment depends upon the general shape of the facilities, the number of specialized areas depends, to some extent upon the preferences of staff. However, a few fundamentals should be kept in mind:

Convenient location of entrances and exits;

Easy access to and among service benches;

TRAFFIC FLOW

The overall layout of the service facility should be planned so that the location of entrances and exists permits a logical flow of work in progress. The arrangement of benches to obtain an efficient traffic pattern is one of the most critical factors in planning a facility.

PERSONAL TOOL/EQUIPMENT STORAGE AREA

A student tool storage room or area should be provided, with adequate shelf space for tool boxes and floor space for equipment. This area should afford maximum security for student tools.

ADDITIONAL FACILITY CONSIDERATIONS

1. Training Stations

Training stations and live work areas must be available in the type and number required for the performance of the tasks outlined in the program goals and performance objectives.

2. Safety

The facilities must meet all applicable safety standards.

3. Maintenance

A regular facilities maintenance program should be used to assure facilities are suitable when required for instruction.

4. Housekeeping

The classroom, laboratory, and support area(s) should be kept clean and orderly.

5. Office Space

An area separate from the classroom and laboratory should be available and convenient for use by the instructor(s) as an office.

6. Instructional Area

A classroom convenient to, but separate from, the laboratory area should be available for instruction and other non-shop activities.

7. Storage

Storage areas for tools, parts, supplies, and machines must be sufficient to support the activities outlined in the program goals and performance objectives. Security should be provided to prevent pilferage and vandalism.

8. Support Facilities

Restrooms, clean up areas, and lockers should be provided convenient to the instructional area.

9. Ventilation

If required, an adequate fume removal system should be in place and operable. When appropriate, heating and cooling systems should be used to provide sufficient comfort for learning.

10. First Aid

A first aid station must be in place, well marked, and complete with appropriate supplies.

11. Facility Evaluation

The advisory committee should be asked to conduct an annual evaluation of the facilities to assure adequacy to meet program needs.

SUGGESTED EQUIPMENT LIST

DIESEL ENGINE MECHANICS

QUANTITY	ITEM DESCRIPTION
	Overhead Crane or Floor Crane
	Diesel Engine Stands
	Diesel Engines - DDA, CAT, Cummins, Perkins, Ford, etc.
	H. D. Battery Charger
	Torque Wrenches, 1/4"-3/8"-1/2"-3/4" 0 in - 600 ft.
	Hot Tank
	Parts Tank
	Vises
	Bench Grinder
	Drill Press & Drill Bits
	Cutaway Item - Engines, Sub Assemblys
	Shop Manuals
	Pressure Tester
	Parts Manuals
	Valve Refacing & Resealing
	Cam Bushing Tools
	Tap & Die Set
	Drop Lights
	Air Hoses
	Gauges - Compressor, Oil, Temp, Vacuum
	Appropriate Service Manual
	Appropriate Service Tool Kit
	Basic Hand Tool Set, Including Metric

Calibrating Nozzles Adjusted To Pump Manufacturer's Specifications

Calibrating Oil, As Recommended

Clean Diesel Fuel

Clean Line Plugs

Clean Pans

Clean Parts Tray

Clean Vise

Clean Work Area

Clean Work Bench

Cleaning Solvent

Comparator Injector Tester or Appropriate Calibrator

Injector Tester

Crocus Cloth

Deep Well Socket Set

Distributor Type Pump

Drive Shaft Installation Tool

Feeler Gauge

Fuel Pipe Socket Set

Grease

Idle Adjusting Tool

Injection Lines, 1/16" i.d. x 20" length, 3/32" i.d. x 20" length

Injector Nut Socket Wrench

Injector spray Tip Driver

Injector Tester

Injector Vise & Rack Freeness Tester

Manufacturer's Specifications

Measuring Tools (mics, calipiers, dial indicators)

Needle Valve Fuel Injector

Nozzle Tester

Oil Can, Hand Type

Pry Bar

PT-G Fuel Pump & Fuel Pump Properly Calibrated

Pump Specification Sheet

Pump Test Stand

Pump Tools

Safety Glasses

Shipping Caps

Shop Towels (lint-free)

Solution for Washing Pump

Tachometer, Hand Type

Tachometer, Remote Type

Test Stand Adapters

Test Stand Manual

Torque Wrench

Torque Wrench, inch-pounds

Torque Wrench, foot-pounds

Typical Tools as recommended by Appropriate Manufacturer

SUGGESTED EQUIPMENT LIST

HEAVY DUTY TRUCK & BUS MECHANICS

QUANTITY	DESCRIPTION
	Overhead Crane (5 ton)
	Diesel Engine Stands (portable/stationary)
	Heavy Duty Battery Charger
	Growler
	Load Tester (volts/amp)
	Hydrometers
	Test lights
	Torque Wrenches (1/4" - 3/8" - 1/2" - 3/4" Drive)
	Hot Tank
	Parts Tank
	Fuel Room - Pump & Injector Test Stand - Rebuild Tools
	Ring Compressors
	Valve Spring Compressors
	Valve Grinder
	Pullers (liner, outside, inside)
	Bench Vises
	Grinder Wheels
	Steam Cleaner
	Hand Tools (wrenches, dockets, pliers, hammers)
	Air Tools/Hoses
	Parts Holder
	Drill Press/Bits
	Measuring Tools (mics, calipiers, dial indicators)

Cutaway Items (teaching purpose)

Oven/Refrigerator

Ram Press

Welding Equipment

Shop Manuals

Line Bore Tool

Counter Bore Tool

Pressure Tester

Magnaflux Kit

Timing Tool

Cam Bushing Tool

Gauges (compression, oil pressure, temp., vacuum)

Pyrometer

Tap and Die Sets (metric/standard)

Easy Out/Extractors

Dynometer

Multimeter (volt/amp/ohm)

Trans Jack 400 lb Cap

Floor Jack 5 ton Cap

Floor Safety Stand 10 ton Cap

DETAILED LIST OF TOOLS AND EQUIPMENT

1	Industrial Puller Set
1	Farm Tractor Puller Set
1	1" Socket Set (1 5/8" - 3 1/2")
1	3/4" Socket Set (7/8" - 2 3/8")
1	1/2" Deep Socket Set (3/8" - 7/8")

1	Allen Set (1/8" - 5/8")
1	Tap & Die Set NC
1	Tap & Die Set NF
1	Pipe Tap Set (1/8" - 1 1/4")
1	Pilot Reamer Set (1/2" - 1 1/4")
1	Cylinder Hone, Rigid
1	Universal Sleeve Puller Set (less sleeve adapter plates)
1	Cylinder Ridge Reamer
1	Thread Chaser
1	Electric Drill (1/2")
2	Electric Drills (1/4")
1	Set Drill Bits (1/16" - 1/2")
1	Screw Extractor Set
1	Copper Tubing Service Kit
1	Oil Leakage Detector
1	Hydraulic Jack (3-ton)
1	Hydraulic Jack (20-ton)
1	Straight Edge (4')
1	Volume Grease Dispenser
1	High Pressure Grease Gun
1	Gear Oil Dispenser
1	Antifreeze tester
1	Battery Hydrometer
4	Creepers (floor)
8	Light Drop Cords (25') (extension)
1	Sledge Hammer

2	Cummins Timing Fixtures
4	Plastic Hammers
4	Piston Ring Compressors
2	Hacksaws
1	Carburetor Tool Kit
1	Soldering Gun Kit
1	Carpenter Square
1	Combination Square
1	Set Box End and Open End Wrenches (1/4"-2"), Metric
1	Set Metric Socket Wrenches
1	Injector Tube Installation Kit
1	Detroit Blower Service Kit
1	Hydraulic Flo-Rater
1	Battery Service Kit
1	Bushing Universal Installation Tool
6	Wire Brushes
6	Carbon Scrapers
1	Photo Tachometer
1	Radiator Pressure Tester
1	Magnetic Crack Detector
1	Water Pressure Crack Detector
1	Universal Precup Puller Set
1	Adjustable Wrench (20")
2	Torque Wrenches (10-150 ft.-lb.)
1	Torque Wrench (100-500 ft.-lb)
1	Tin Shears

2	Valve Spring Compressors
1	Micrometer Set (0"-6") With Standards & Case
4	Micrometers (0-1"
4	Micrometers (1"-2")
4	Micrometers (2"-3")
2	Inside Micrometer Sets (2"-8")
1	Micrometer Depth Gauge (0-6")
2	Oil Measures (1 qt.)
2	Oil Measures (2 gal.)
2	Micrometer Ball Attachment
1	Universal Dial Test Indicator Set
1	Cylinder Gauge (2 1/10"-6")
1	Pipe Wrench (24")
1	Brake Spring Pliers
2	Battery Carriers
2	Water Buckets
2	Pairs, Booster Battery Cables
2	Pry Bars 23/32" x 24"
2	Rolling Head Bars 19/34" x 18"
10	Screwdrivers (assorted)
12	Files (assorted)
2	Compression Testers
1	Leakage Tester
2	Log Chains (3/8" x 25')
1	Heli-coil Kit
1	Stud Remover 5/8"-1")

1	Copper Tubing Service Kit (3/16"-5/8")
1	Feeler Gauge Set
	Hand Oil Cans
	Gasket Material
	Cotter Pins (assorted)
	Washers
1	Fire Extinguisher (20-lb.)
1	Flex Stone Set or Glaze Breaker
	Drain Pans & Buckets
1	Caterpillar Fuel Injection Test Stand & Accessories
1	GM Unit Injector Tester & Accessories
1	Injector Flow Comparator
1	Diesel Nozzle Analyzer
1	Nozzle Valve Microscope
1	Nozzle Valve Lapping Device & Accessories
1	Ultrasonic Cleaner
1	Nozzle High Pressure Cleaner
1	Torque Vise
1	Concentricity Gauge
2	Diesel Nozzle Testers
1	Compression Tester
2	Fuel System Analysis Kit
8	Pump & Nozzle (miscellaneous tool & service) kits
1	Portable Floor Jack (10-ton)
1	Portable Floor Jack (4-ton)
6	HD Engine Stands

2	PTO Dynamometers
4	Chasis Dynamometers
1	Hydraulic Press (75-ton)
1	Hand Press (3-ton)
1	Clutch Pressure Plate Adjusting Fixture
1	10" Lathe & Attachments
1	3/8" Drill Press (bench)
1	3/4" Drill Press (floor)
1	Connecting Rod Alignment Fixture & Adapters
2	Valve Grinders
2	Valve Seat Grinders
1	Air Compressor (3 h.p.)
	Air Hose & Fittings
1	Mobile Floor Crane (4,000 lbs.)
1	Valve Spring Tester
	Exhaust Ventilating System
	Transmission Jack
	Transmission Overhaul Stand

SAFETY

The Florida State Board of Education establishes rules for the operation of public schools. Part III, Section B, Chapter 6A-2 of the State Board of Education Rules contains the standards for existing educational facilities. Subsections deal with the entire school facility in regard to such topics as electrical equipment, flammable materials, ventilation, fire safety, storage, and illumination.

Specifically, subsection 6A-2.97, which follows, contains regulations unique to Vocational classes.

S.B.E. Rule 6A-2.97: Safety devices in shops, laboratories, and other process areas

(1) Use of personal protection devices and other protective equipment is required when students and staff are exposed to the following:

(a) Arc welding, heavy gas cutting, scarfing
(b) Spot welding, brazing, or cutting
(c) Machining of any materials causing flying chips
(d) Injurious radiations, dusts, fumes, gases, vapor mists
(e) Sledging, hammering, chipping, scaling, drilling, grinding, chiseling, wire brushing, and caulking operations where flying objects or particles may strike the body
(f) Chemicals, acids, caustics, and molten metals

(2) Personal protection devices which come in contact with the skin shall be sanitized after each use.

(3) Clothing, jewelry, and personal grooming of personnel in shops and labs shall not constitute a hazard.

(4) Individual equipment power shut-off, within reach of the operator, shall be provided for all working machinery. Each individual machine shall be equipped with an approved electromagnetic starter switch.

(5) No safeguard, safety appliance, or safety device guarding a machine or machine part shall be removed or made ineffective except when the machine is stopped and for the purpose of immediate cleaning, repairing, or adjusting. Upon completion of repairing, cleaning, or adjusting, such guard, appliance, or device shall immediately be replaced. Any shop or laboratory tool or equipment found to be unsafe shall be red-tagged and removed from service until the condition is corrected.

(6) The floors in areas where machines are used shall be kept free from waste, grease, and obstructions.

(7) Welding operations shall be located in a shielded area, and

the area shall be free of combustible material and persons not wearing protective devices.

(8) Areas where toxic fumes are produced shall be properly vented to the outside.

(9) Flammable fumes or dust produced in a student-occupied facility shall be mechanically exhausted to the outside with approved explosion-proof motor-driven equipment with filters in place.

(10) Each space equipped with unprotected gas valves accessible to students shall have an approved master cut-off readily accessible to the instructor.

(11) Each shop or lab equipped with electrically powered machinery accessible to students shall have one or more conspicuously color-coded disconnect switches at convenient locations throughout the space.

(12) Kilns shall be properly shielded from combustibles, combustible surfaces, and personnel, and shall not be located in the path of or adjacent to any means of egress, or exposed to unauthorized persons.

(13) Automotive, body, and frame repair areas requiring welding and cutting shall be separated from engine overhaul and

related fuel handling activities.

(14) A tire cage shall be provided when pressurizing tires on split rims.

(15) Vehicle lifts shall be provided with a mechanical safety lock.

(16) Piping and working machinery with component parts shall be safety color-coded in accordance with ANSI Z53.1-1971.

(17) The safety color-coded chart shall be posted in a conspicuous place available to employees and students.

(18) Hazardous work and storage areas shall be identified by appropriate caution signs.

(19) All equipment designed to be permanently mounted shall be securely fastened to its supporting surface.

(20) Safety zone lines shall be used on the floor area surrounding working machinery.

(21) Fume hoods shall be provided and kept in proper operating condition. Operations where flammable gas, toxic vapors, or noxious odors are given off shall be performed in the

fume hoods.

(22) Safety equipment such as showers and floor drains, eye wash, fire blankets, and proper extinguishing equipment shall be provided, properly installed, and maintained correctly.

INSTRUCTOR RESOURCES

LEARNING RESOURCES

Support material consistent with both program goals and performance objectives should be available to staff and students.

1. Service Manuals

   Manuals with current manufacturer's service procedures and specifications. These manuals must be located where students can use them while working in the shop area.

2. Multi-Media

   Appropriate up-to-date multi-media materials such as flip charts, tape slides, motion pictures, overhead transparencies and video projection media should be decentralized, readily available wherever possible, and utilized in the training process.

3. Instructional Development Services

   The services of professional instructional development personnel should be used when available. At a minimum, equipment and supplies should be available for duplication of printed material and overhead projector transparency development. Instructional development personnel should conduct in-service workshops and/or other training in

curriculum and media development on a structured basis.

4. Periodicals

   Current general and technical magazines and newspapers should be available for student and instructor use.

5. Student Materials

   Necessary instructional texts or pertinent material should be available for each student to satisfy the objectives of the mode of instruction used. Where textbooks are used, specialized texts should carry a copyright date no older than 3 years, basic texts no older than 6 years.

PRINTED AND AUDIOVISUAL MATERIALS

This list contains an extensive number of organizations providing training materials. Some materials are free; for others, there is a charge. Details should be requested in writing prior to ordering.

PUBLICATIONS

1. Dagal, John F. Diesel Engine Repair. New York: John Wiley and Sons, Inc., 1982.

2. Detroit Diesel Allison, Service Manual. Detroit: Division of General Motors Corporation, 1974.

3. Foutes, William A. **Diesel Engine Mechanics.** Stillwater, OK: Mid-America Vocational Curriculum Consortium, 1977.

4. **Fuel System: Fuel Injection Pump - Robert Bosch "A" Type for DV-462B 2nd DV-550B Engines.** Chicago: International Harvester Company.

5. **Fundamentals of Service: Engines.** Fifth Edition. Moline, Illinois: Deere and Company, 1980.

6. Kates, Edgar J., and Luck, William E. **Diesel and High Compression Gas Engines.** Third Edition. Chicago: American Technical Society, 1974.

7. **Roosa Master: Operation and Instructional Manual: Model DP Pump.** Hartford, CT: Stanadyne/Hartford Division/Roosa Master.

8. Schulz, Erich J. **Diesel Mechanics.** New York: Gregg Division, McGraw-Hill Book company, 1977.

9. **Service Manual, Detroit Diesel Engines.** Detroit: Detroit Diesel Allison, 1975.

10. **Technical Manual: John Deere Fuel Injection Equipment - Robert Bosch.** Moline, Illinois: Deere and Company, April 1974.

11. Toboldt, William K. **Diesel: Fundamentals, Service, Repair.** South Holland, Illinois: Goodheart-Willcox Company, Inc., 1980.

12. Giachino, J.W.; Weeks, William; and Brune, Elmer. Welding Skills and Practices. Fifth Edition. Chicago: American Technical Society, 1977.

13. H and NH Series Shop Manual. Columbus, Indiana: Cummins Engine Co., Inc.

14. Hobart Welding School Workbook. Troy, Ohio: Hobart Brothers' Technical Center.

15. Jefferson, T.B. The Welding Encyclopedia. 17th edition. Morton Grove, Illinois: Monticello Books, 1974.

16. New Lessons in Arc Welding. Cleveland, Ohio: The Lincoln Electric Co./James F. Lincoln Arc Welding Foundation.

17. OSHA Safety and Health Standards Digest. Occupational Safety and Health Administration/ U.S. Department of Labor, June 1975.

18. Parady, Harold W., and Turner, J. Howard. Electric Energy. Athens, Georgia: American Association for Vocational Instruction Materials, 1976.

19. Safety Practices and Procedures in School Shops. New Jersey: Division of Vocational Education/Department of Education.

20. Service Manual: 3406 Industrial and Marine Engine. Caterpillar Tractor Company, 1979.

21. Shop Manual. Columbus, Indiana: Cummins Engine Co., 1974.

22. Smith's Short Course for Gas Cutting, Welding, Brazing. Minneapolis, Minnesota: Division of Tescom Corp./Education Department of Smith Welding Equipment.

23. Stockel, Martin W. Auto Service and Repair. Homewood, Illinois: Goodheart-Willcox Co., 1978.

24. Strong, Merle E. Accident Prevention Manual. American Technical Society, 1975.

25. V-71 Service Manual. Detroit, Michigan: Detroit Diesel Allison, Revised 1975.

26. ABC's of Hand Tools. Detroit, Michigan: General Motors Corporation.

27. Althouse, Andrew D.; Turnquist, Carl H.; and Bowditch, William A. Modern Welding. Homewood, Illinois: The Goodheart-Willcox Co., 1970.

28. An Accident Prevention Program for School Shops and Laboratories. U.S. Department of Education.

29. Billiet, Walter E., and Goings, Leslie F. **Automotive Electrical Systems.** 3rd Edition. Chicago, Illinois: American Technical Society.

30. Crouse, William H. **Automotive Mechanics.** 7th Edition New York, New York Webster Division/McGraw-Hill Book Company, 1975.

31. **Cummins Engine Company Shop Manual.** Columbus, Indiana: Cummins Engine Co., Inc., 1974.

32. **Engine Service Manual.** Peoria, Illinois: Caterpillar Tractor Company, 1972.

33. Forier, Louis C. **Motor Trucks and Diesel Repair Manual.** 33rd Edition. New York: Motor, 1980.

34. **Fundamentals of Service: Bearings and Seals.** 3rd Edition Moline, Illinois: Deere and Company, 1980.

35. **Fundamentals of Service: Electrical Systems.** 4th Edition Moline, Illinois: Deere and Company, 1979.

36. **Fundamentals of Service: Fasteners.** 2nd Edition Moline, Illinois: Deere and Company, 1979.

37. **Fundamentals of Service: Fuels, Lubricants, and Coolants.** 4th Edition Moline, Illinois: Deere and Company, 1980.

38. Fundamentals of Service: Hydraulics. Moline, Illinois: Deere and Company, 1967.

39. Analyzing Hydraulic Systems. Cleveland, OH 44112: Parker-Hannifin Corporation, 1976.

40. Fluid Power Designer's Lightning Reference Handbook. Orange, CA: Paul-Munroe Hydraulics, Inc., 1976.

41. Fluid Power I. Cleveland, OH 44112: Parker-Hannifin Corporation, 1975.

42. Fluid Power II. Cleveland, OH 44112: Parker-Hannifin Corporation, 1975.

43. Hydraulics. Athens, GA 30602: American Association for Vocational Instructional Materials, 1974.

44. Industrial Hydraulics Manual. Troy, MI: Sperry Rand Corporation, 1970.

45. Pippinger, John J., and Tyler G. Hicks. Industrial Hydraulics. Dallas, TX: Gregg Division/McGraw-Hill Book Company, 1979.

TEXTBOOKS

1. Diesel Mechanics: Electrical Systems, #400040, MAVCC, 1984.

2. Diesel Mechanics: Fuel Systems, #400055, MAVCC, 1984.

3. Florida State Department of Education, Vocational Division. Teaching Academically Disadvantaged Students in Vocational Education Courses, #DD012 BK-82.

4. Florida State Department of Education, Vocational Division. Keys to Managing Competency-Based Instruction, #TE036 BK-77.

5. Florida State Department of Education, Vocational Division. Guidelines For The Review and Selection of Instructional Materials for Competency-Based Education, #TE034 BK-80.

6. Florida State Department of Education, Vocational Division. Employability Skills Series, #CE001 SS-81.
(CE003, CE004, CE009, CE010, CE017, CE018, CE024, CE025, CE029, CE030, CE037, CE038)

7. Florida State Department of Education, Vocational Division. Heavy Duty Truck and Bus Student Learning Guides, #IE29355-83.

8. Florida State Department of Education, Vocational Division. Heavy Duty Truck and Bus Teacher Guide, #IE366BK-85.

AUDIO-VISUAL

1. **Diesel Mechanics: Fundamentals,** (transparency set) #400030, MAVCC, 1984.

2. **Diesel Mechanics: Electrical Systems,** (transparency set) #400045, MAVCC, 1984.

3. **Diesel Mechanics: Fuel Systems,** (transparency set) #400060, MAVCC, 1984.

4. Detroit Diesel Factory Engine Slide Program.

5. Cummins Diesel Factory Engine Slide Program.

6. Caterpillar Diesel Factory Engine Slide Program.

7. Fuller Road Ranger Factory Transmission Slide Program.

8. Mack Factory Transmission Slide Program.

9. Detroit Allison Factory Transmission Slide Program.

10. Caterpillar Factory Hydraulics Program.

11. Caterpillar Factory Electrical Program.

12. Spicer Factory Rear Axle Program.

13. Rockwell Factory Rear Axle Program.

14. Bendix Factory Air Brake Program.

15. Bosch Factory Fuel System Program.

16. Roosa Master Factory Fuel System Program.

17. Ford Factory Driveline Program.

18. Mack Air Conditioning Factory Program.

PROFESSIONAL ORGANIZATIONS AND SUPPORT SERVICES

PROFESSIONAL ORGANIZATIONS

Membership in professional associations offers vocational educators an enormous range of opportunities for working together to strengthen the field and to develop personal competence and satisfaction in work. The associations have similar goals and activities. They seek excellence in program content by means of joint efforts among members, communications that keep members current, forums for the discussion of issues in the field, useful and stimulating publications and sound professional growth experiences at local, state, regional, and national meetings and annual conventions. They are concerned with increasing public understanding and support of the field.

VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)

AUTOMOTIVE SERVICE COUNCILS (ASC)

FLORIDA AUTOMOBILE DEALERS ASSOCIATION (FADA)

FORD SERVICE MANAGER COUNCIL

FLORIDA VOCATIONAL ASSOCIATION

AUTOMOTIVE SERVICE EXCELLENCE (ASE)

ASSOCIATED GENERAL CONTRACTORS (AGC)

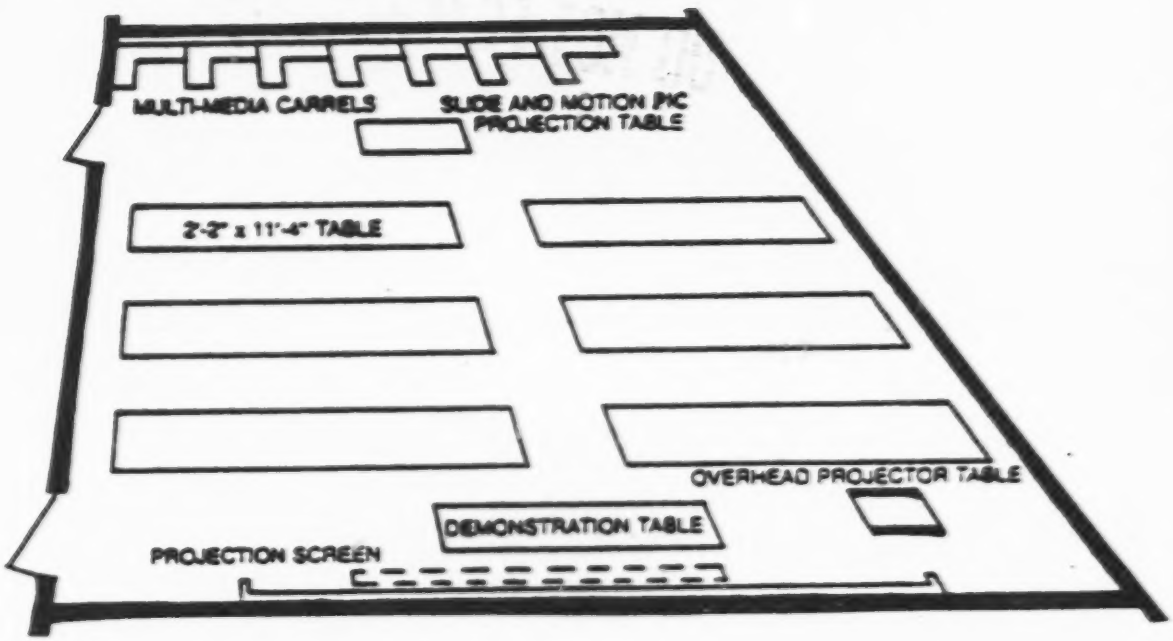
CENTRAL FLORIDA MAINTENANCE COUNCIL

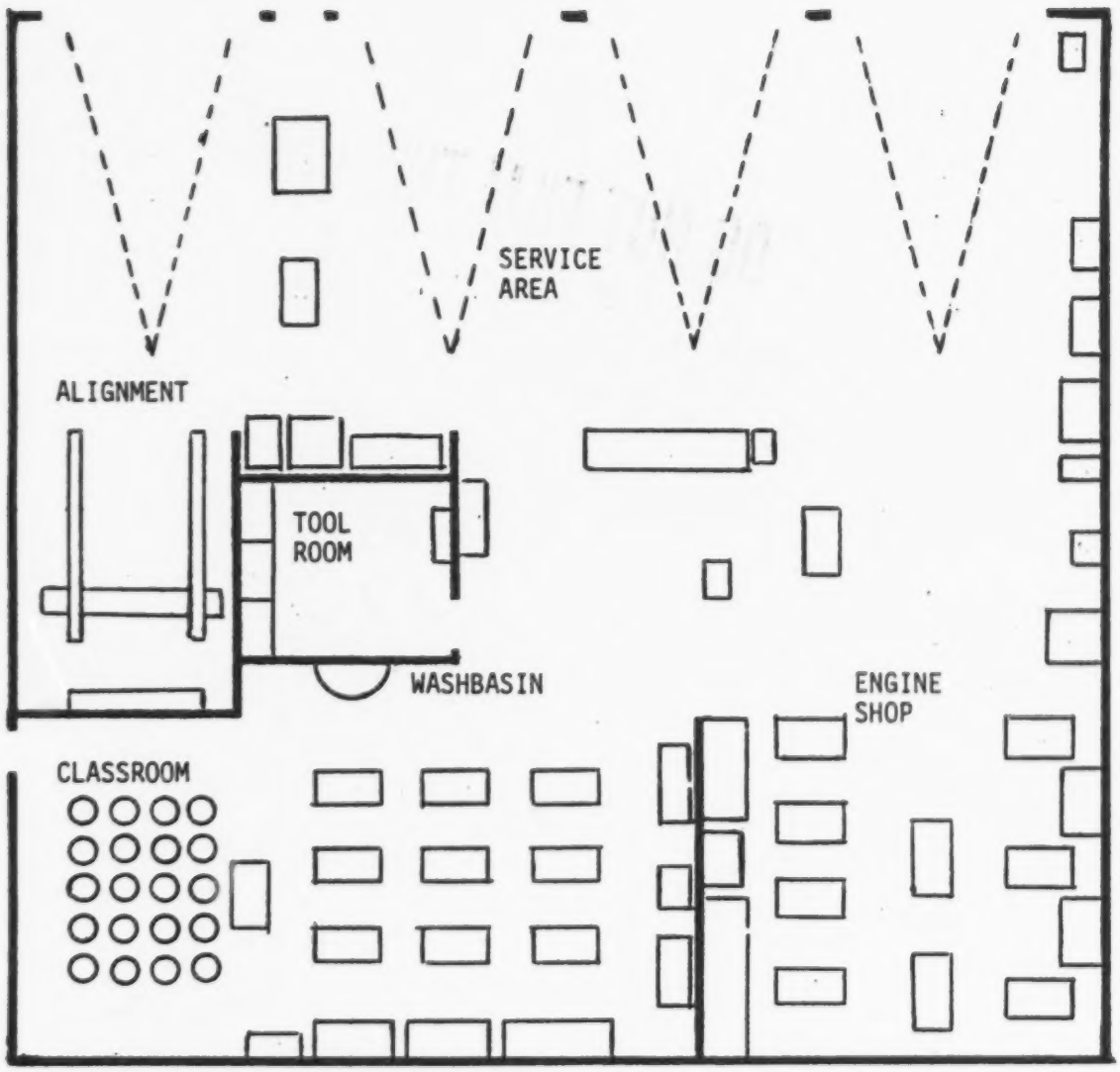
FLORIDA ASSOCIATION OF TRADE AND INDUSTRIAL EDUCATORS

APPENDIX A

FACILITIES DIAGRAMS

SUGGESTED LAYOUT FOR A CLASSROOM

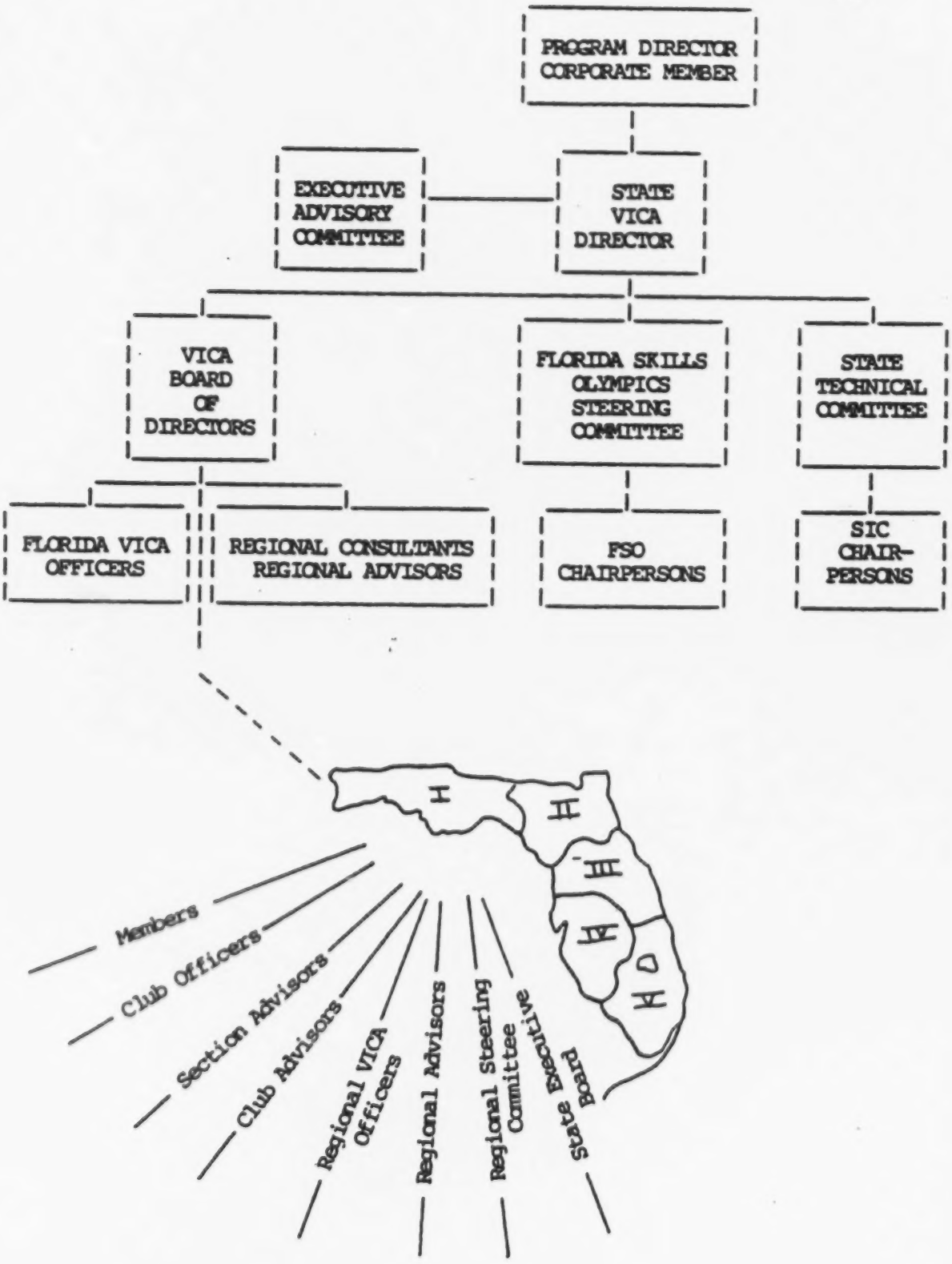


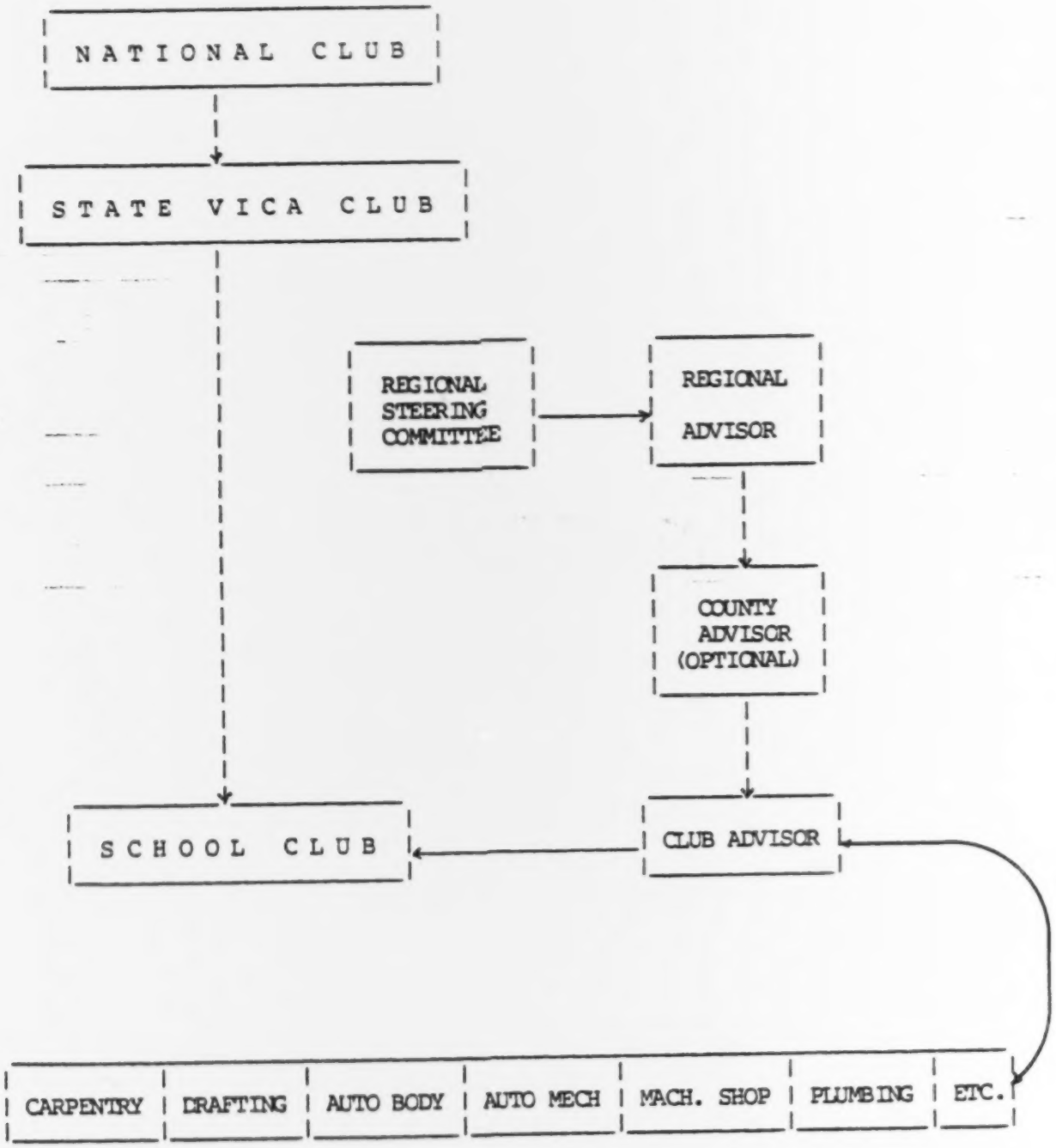


DIESEL AND HEAVY DUTY TRUCK AND BUS SHOP LAYOUT
APPROXIMATE SIZE 80' x 80'

APPENDIX B

VICA ORGANIZATION CHART


PROGRAM DIRECTOR
CORPORATE MEMBER
EXECUTIVE ADVISORY COMMITTEE
STATE VICA DIRECTOR
VICA BOARD OF DIRECTORS
FLORIDA SKILLS OLYMPICS STEERING COMMITTEE
STATE TECHNICAL COMMITTEE
FLORIDA VICA OFFICERS
REGIONAL CONSULTANTS REGIONAL ADVISORS
FSO CHAIRPERSONS
SIC CHAIR-PERSONS
I
II
III
IV
V
Members
Club Officers
Section Advisors
Club Advisors
Regional VICA Officers
Regional Advisors
Regional Steering Committee
State Executive Board


NATIONAL CLUB
STATE VICA CLUB
REGIONAL STEERING COMMITTEE
REGIONAL ADVISOR
COUNTY ADVISOR (OPTIONAL)
SCHOOL CLUB
CLUB ADVISOR
CARPENTRY
DRAFTING
AUTO BODY
AUTO MECH
MACH. SHOP
PLUMBING
ETC.